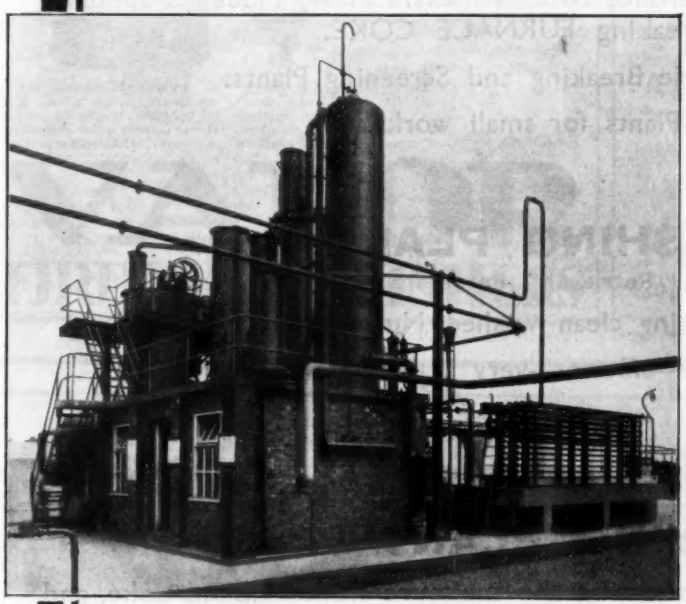
GAS JOURNAL

LIGHT . HEAT . POWER . BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. 204. 85th Year. LONDON, DECEMBER 20, 1933. No. 3683. Price 1s.

SIMON-CARVES
BENZOLE PLANTS



Simon-Carves Benzole Recovery and Rectification Plant at the Partington Works of the Manchester Gas Dept.—Erected 1933.

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GAS SCRUBBERS

THERMOSTATIC AND CENTRALISED CONTROLS
ROBUST CONSTRUCTION
MINIMUM ATTENTION

Over 30 years' experience in the construction and operation of BENZOLE PLANTS.

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INSULATING BRICKS — RECUPERATOR TUBES
Special semi-silica quality for Segmental Retorts
with no Expansion or Contraction at 1400° C.
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LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in progress for early delivery.

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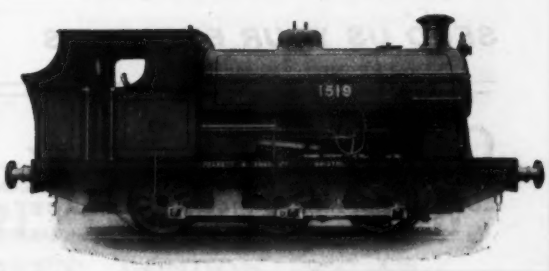

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Producing clean washed Nuts.

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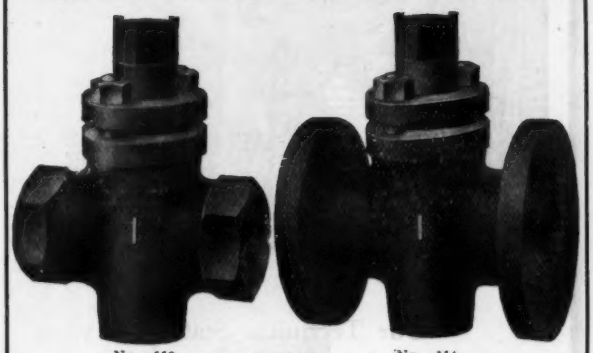

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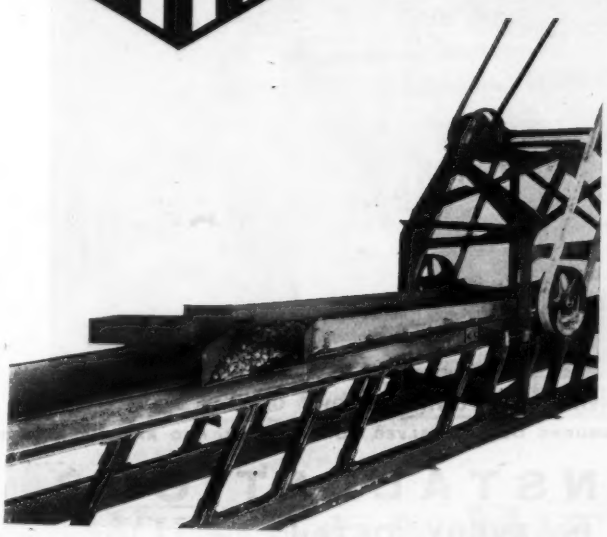

"H.H." Coke Screen at Wolverhampton Gas Works.

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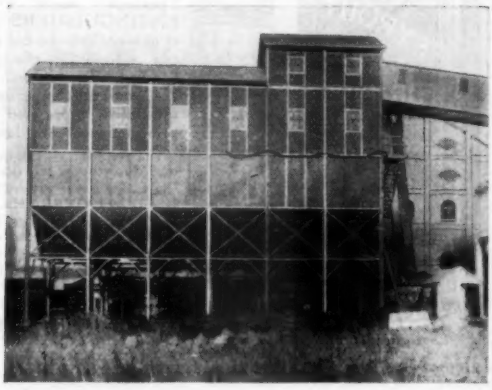

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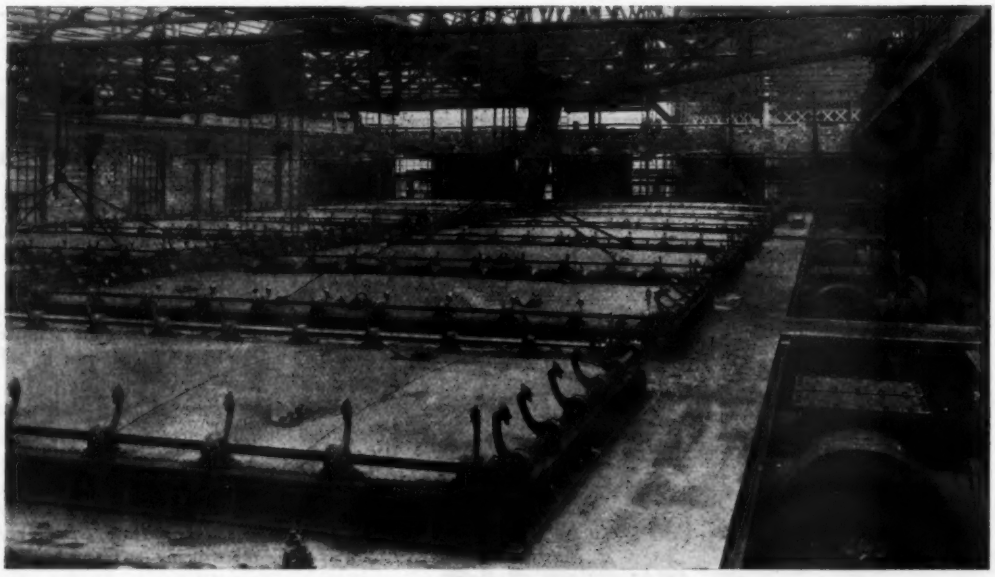

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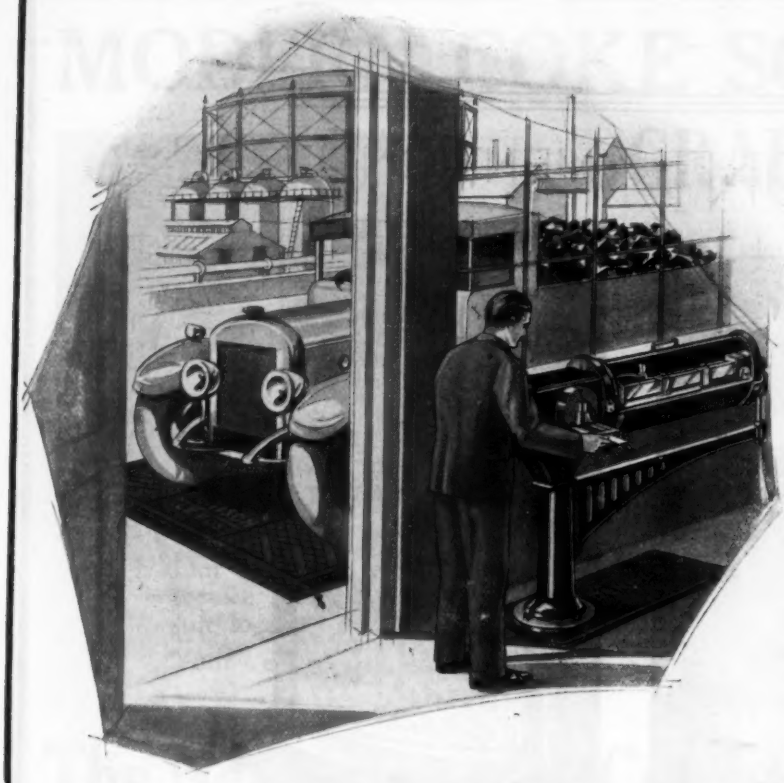

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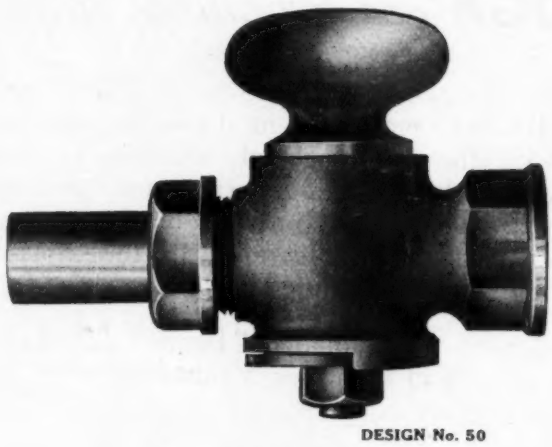

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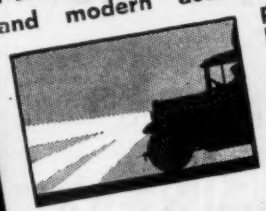

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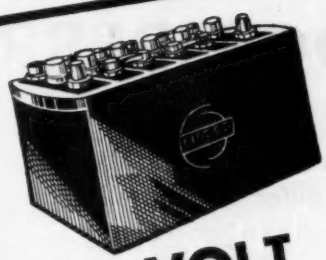

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PRODUCERS FOR GASIFYING COKE BREEZE

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Whilst the "Livewire" Screens installed in Gasworks differ structurally from those handling gooseberries, in both instances it is the intensive yet smooth and gentle vibration that gives accurate grading . . . without producing "fines" in the coke or bruising the gooseberries.

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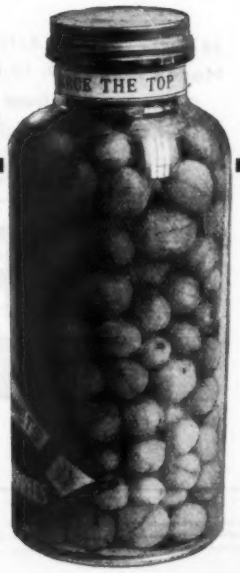

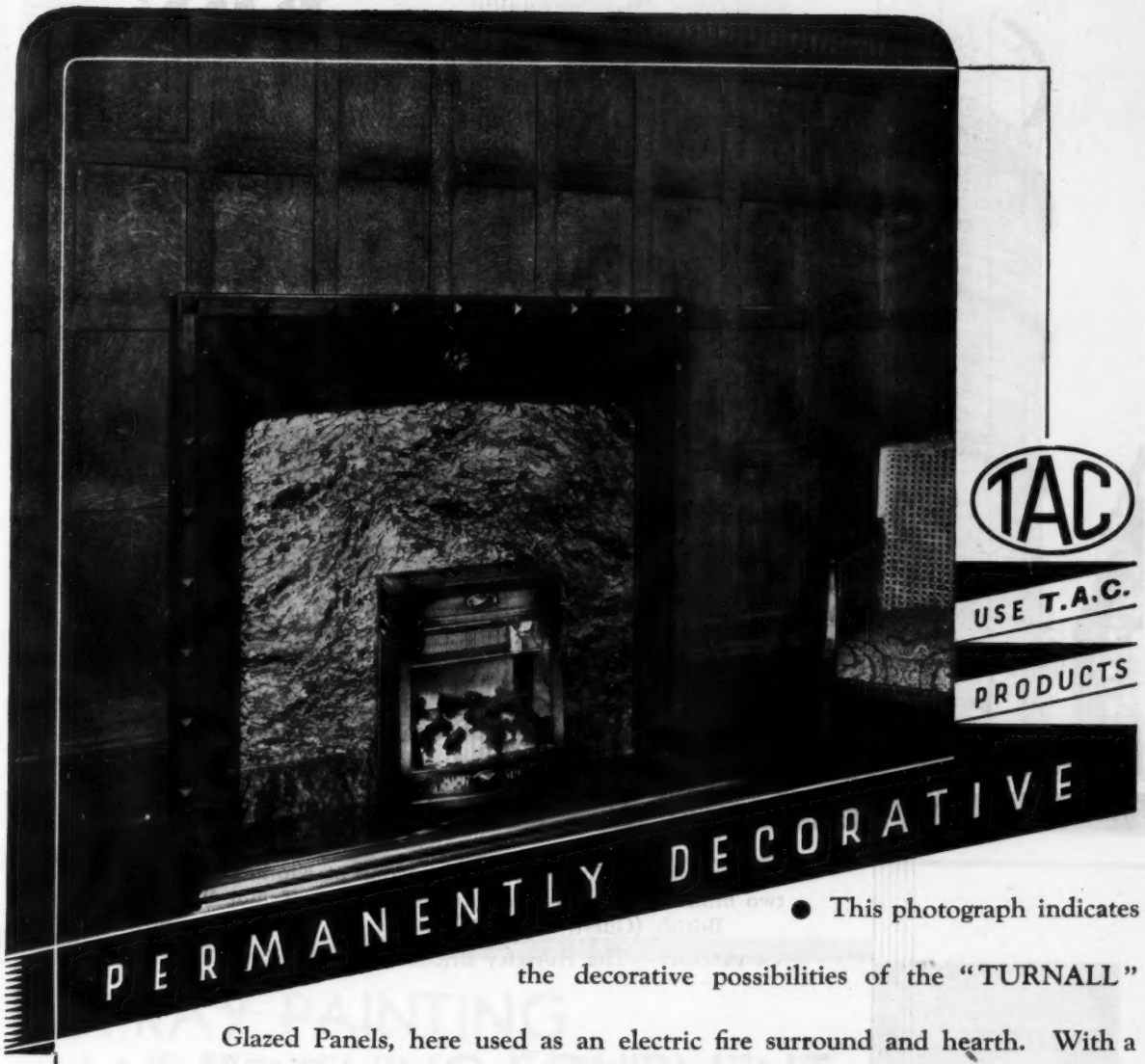

● This photograph indicates the decorative possibilities of the "TURNALL" Glazed Panels, here used as an electric fire surround and hearth. With a highly glazed finish which is exceptionally hard and non-brittle, "TURNALL" Glazed Panels have extraordinary resistance to heat and moisture. For these reasons, as well as for their attractive colours and designs, they are admirable for the panelling of walls, for splash backs, bath panels, table tops, gas and electric fire surrounds, etc.

"TURNALL" Oak-Grained Asbestos Panels are also shown in the photograph, providing a panelling which is remarkably effective in use and appearance.

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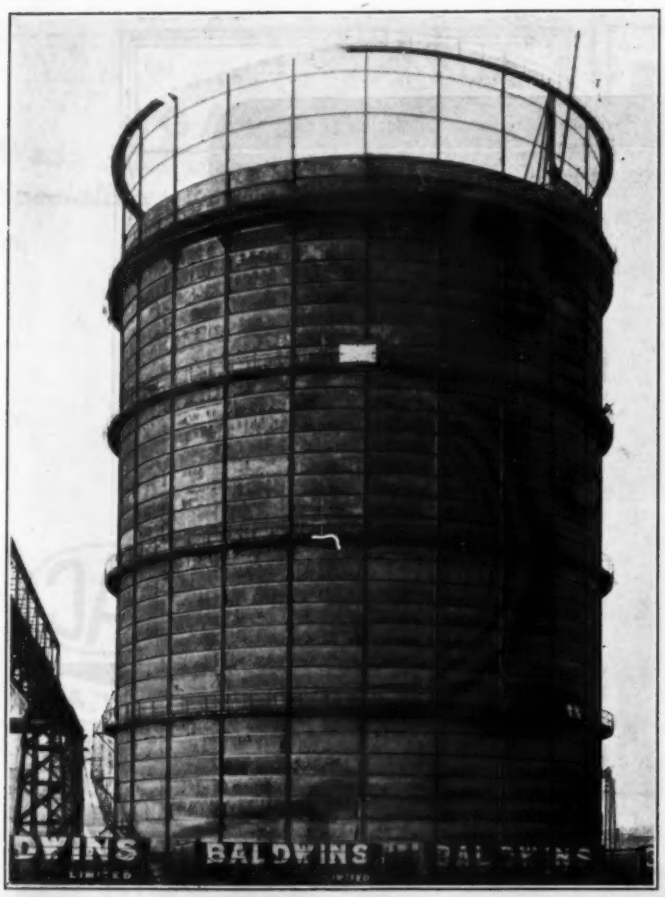
"TURNALL" Glazed Panels

Ф T.G.1



DRY GASHOLDERS

(KLONNE PATENTS)

Photograph showing progress of erection of Klonne Dry Gasholder, two million cubic feet capacity, at the Port Talbot Works of the British (Guest, Keen, Baldwin) Iron & Steel Company.
Contractors—The Horseley Bridge & Engineering Company, Ltd.

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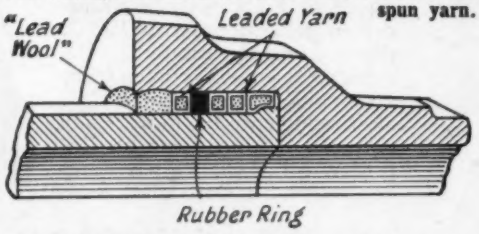
PATENT FLEXIBLE JOINT
for Gas Mains, with LEADED YARN in place of ordinary spun yarn.



THE LEAD WOOL Co., LTD.
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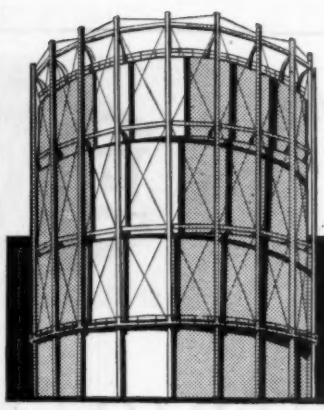
'Phone: Snodland 84216. 'Grams: "Strength, Phone, Snodland."



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DURING our long association with the Gas Industry we have been entrusted with the design and manufacture of all types of Holders and Gas Plant for use in all parts of the World.

Your contracts can be placed in our hands with absolute confidence.

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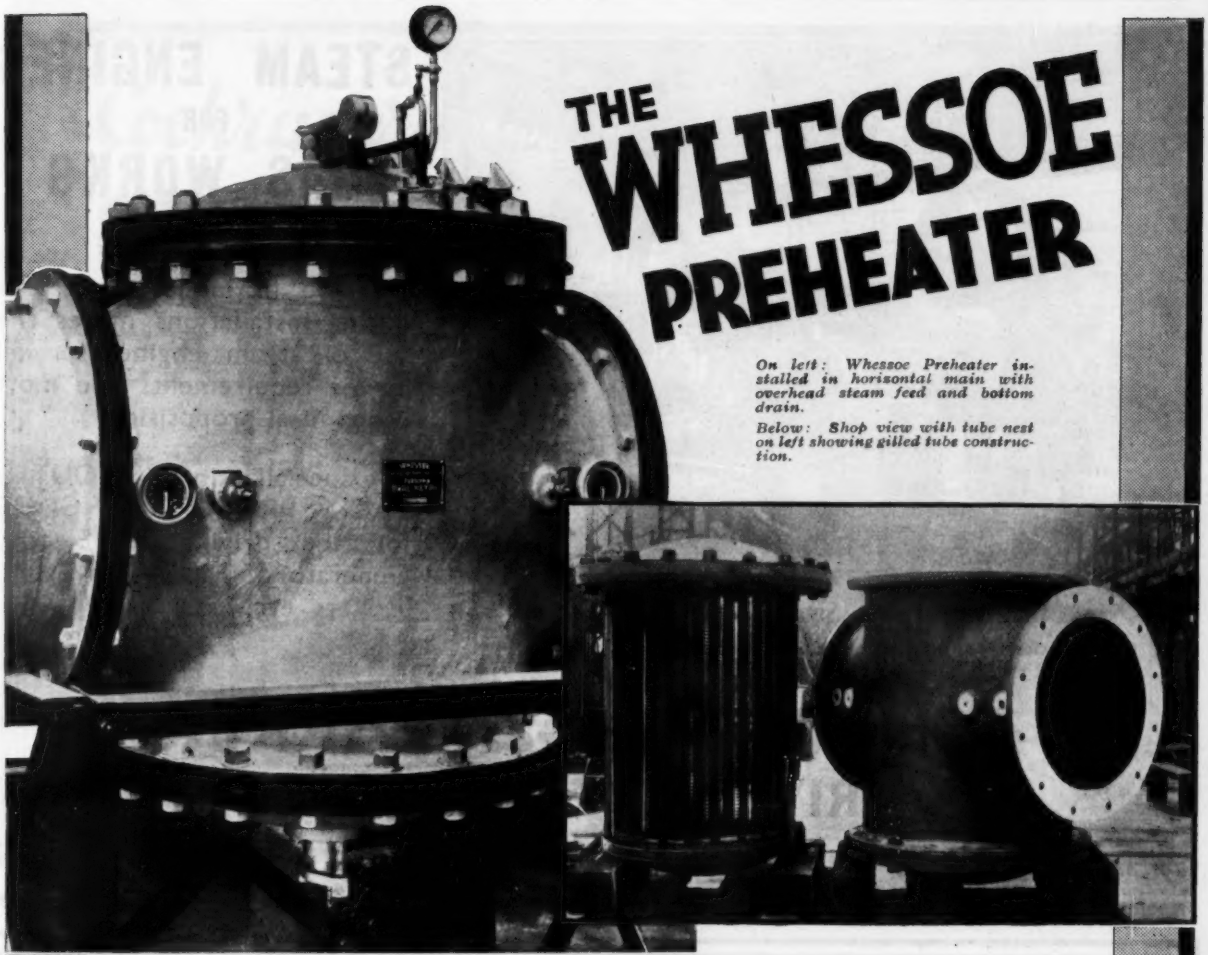
THE WHESSOE PREHEATER



On left: Whessoe Preheater installed in horizontal main with overhead steam feed and bottom drain.

Below: Shop view with tube nest on left showing gilled tube construction.

Increased purifying capacity by gas preheating

RESULTS

The Whessoe Preheater using live or exhaust steam raises the gas temperature at inlet to purifiers from 10° to 80° F. according to time of year and nature of oxide. The oxide mass is thus brought to its most active state with the following beneficial results :—

Increased gas capacity of boxes.
More efficient H_2S removal.
Higher sulphur content of oxide.
Oxide of low activity rendered more active.

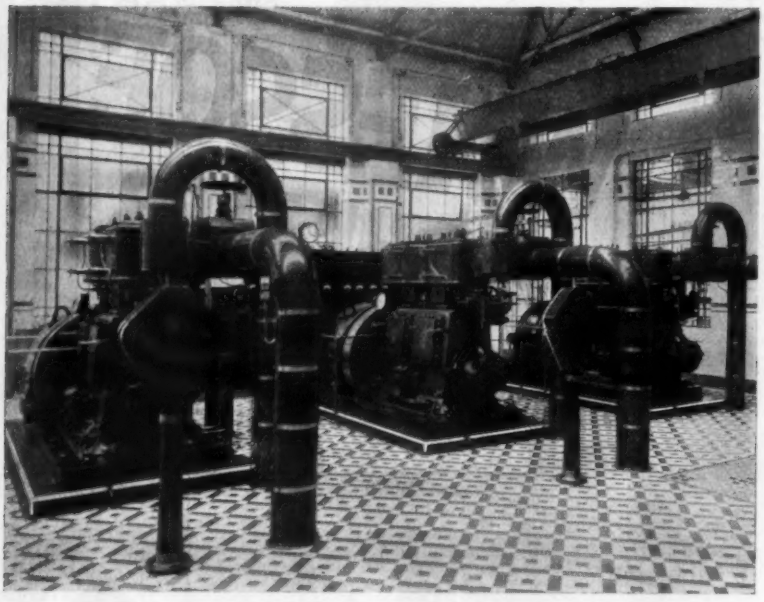
ADVANTAGES

The Whessoe Preheater in achieving improved purification results also has the following constructional advantages :—

Can be arranged for installation in any main at any angle.
Tube nest completely removable for cleaning or storage during summer.
Negligible back pressure :: Low Cost :: Compact :: Sturdy.

SUCCESSFUL GAS TREATING PLANT BY WHESSOE DARLINGTON

THE WHESSOE FOUNDRY & ENGINEERING COMPANY LTD.



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The large surplus of steam available in modern gas producing installations makes the use of steam engines for all power requirements the most economical proposition.

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ASHWORTH & PARKER
RIVERSIDE WORKS
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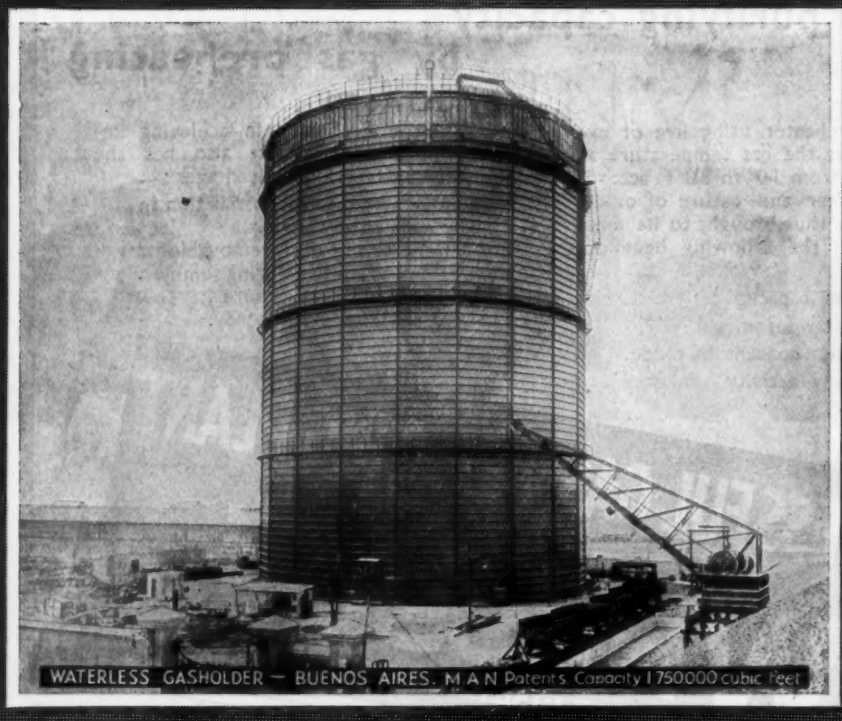
Tel. Add. : "Kinetic, Bury" *Phone :* 620/1



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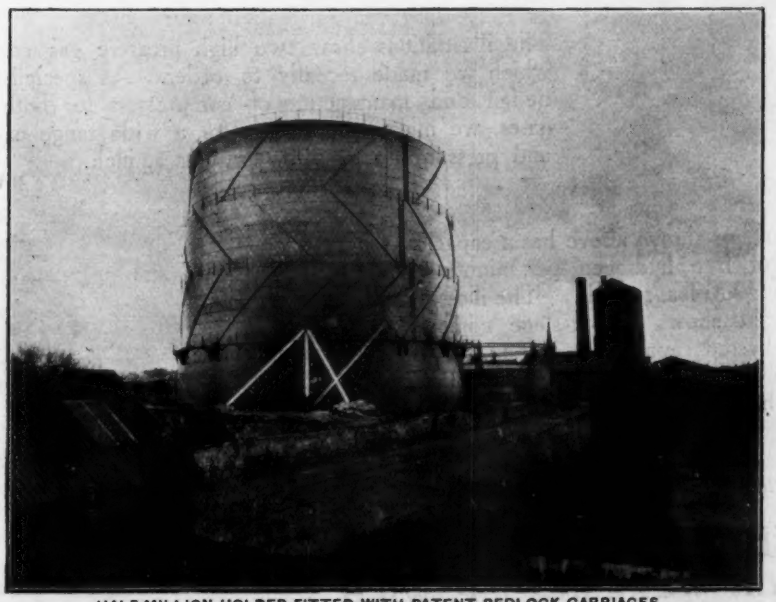
CONDENSERS: Water Tube, Annular or Open Atmospheric.

TOWER SCRUBBERS.

PURIFIERS: Water or Dry Lute Cast Iron or Ferro Concrete Boxes.



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OIL and CHEMICAL WORKS PLANT.

STRUCTURAL WORK of every description.

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Facts prove that Peebles' Street Lamp Governors make Street Lighting Cheaper

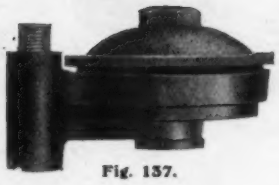

Fig. 137.

_____Gas Department.

"I am sure that in many towns the use of Governors and fixed nipples would reduce mantle consumption by at least 50%, and there would be a very appreciable saving in gas due to the Governors giving a constant outlet pressure. Our records show

Year ending 1930—
Burner Nozzles : 12,922.
Average Mantles per Burner Nozzle : 2·8.
All lamps handlighted without controllers or fixed nipples.

Year ending 1932—
Burner Nozzles : 14,896.
Average Mantles per Burner Nozzle : 1·7.
All lamps are fitted with fixed nipples and Peebles' Governors.

We anticipate further reduction in mantles during year ending 1934."

(Signed)_____
Engineer and Manager.
_____Corporation.

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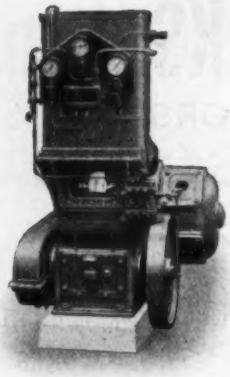
Bonnington
EDINBURGH

This gives an idea of what you can save on your Street Lighting account by using Peebles' Street Lamp Governors. Ask for particulars.



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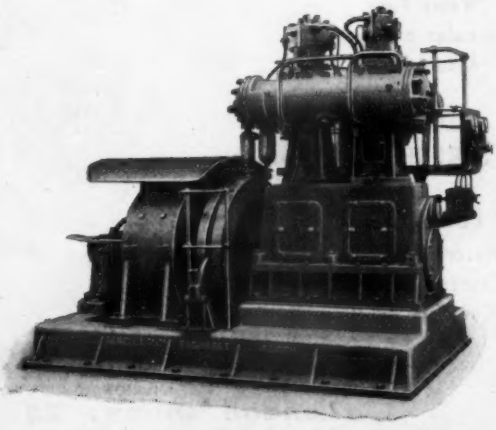
pressures up to 5,000 lbs. per sq. in.

The illustrations show two high pressure gas compressors which we made recently to order. As specialists in the design and manufacture of compressors for both air and gases, we make compressors for a wide range of capacity and pressure up to 5000 lbs. per sq.inch.

The compressor shown above has a capacity of 25 cu.ft. of free hydrogen per minute compressed to 3000 lbs./sq.inch. The illustration on the right shows a four-stage compressor with a delivered capacity of 200 cu.ft. of free town's gas per minute compressed to 5000 lbs. per sq.inch.



For full information regarding gas compressors, write, giving particulars of the duty required, to—

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The chromium-plated "K.C.U." is the best and most efficient Sink Heater we have ever offered. It has been designed for long and continuous service, and the chromium-plated finish minimises maintenance costs. The 10 c.f. "K.C.U." can deliver 4½ gallons of water per hour at a temperature of 140° F., so the "K.C.U." is equal to heaters of greater capacity.

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Recent
"Labourless" Carburetted-Water-Gas Plant

OXFORD

Rated capacity of both Sets, 4,500,000 cu.ft. gas daily.

An Official Test of this Installation showed the following *Actual Results*, without any deduction for the adverse effect of excess impurities in the generator fuel:—

Gas production per Set, per 24 hours ...	2,394,000	cu.ft.
Calorific value of gas	462	B.Th.U.
Oil used per 1,000 cu.ft.	1·53	galls.
Dry coke used per 1,000 cu.ft.	30·05	lbs.
Fixed carbon actually consumed in generator per 1,000 cu.ft.	26·19	lbs.

This 26·19 lbs. of carbon per 1,000 cu.ft. also produced automatically 65·0 lbs. of steam (from and at 212° F.) for use in the plant, and gasified 1·53 gallons of oil.

The above results, obtained when gasifying coke containing 84·5% fixed carbon, correspond to the following thermal yields* from the raw materials:—

1·32 therms as oil gas from each gallon oil gasified, in addition to residual oil-tar—about 15% of the oil used.

86·4 therms as blue-gas from each 1,000 lbs. dry coke, in addition to the production of the above waste-heat steam and the gasification of the oil.

*Computed by the method described in the Proceedings of The Institution of Gas Engineers, 1927-8, p. 526.

Humglas House,
Carlisle Place, London, S.W. 1.

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THE GOVERNOR-GENERAL GAS COOKER is the most striking advance in the development of the SINGLE BURNER OVEN.

THE PATENT BOTTOM FLUE by its ingenious method of construction compels the heat to circulate throughout the entire oven, giving a BETTER Heat Distribution before it leaves at the Bottom by means of the PATENTED DOOR FLUE. The Heat then takes its natural course up the flue in the door, along the passage over the dome of the cooker, and finally passing out of the flue outlet in the CORRECT POSITION at the top of the oven.

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General Gas Appliances Ltd.
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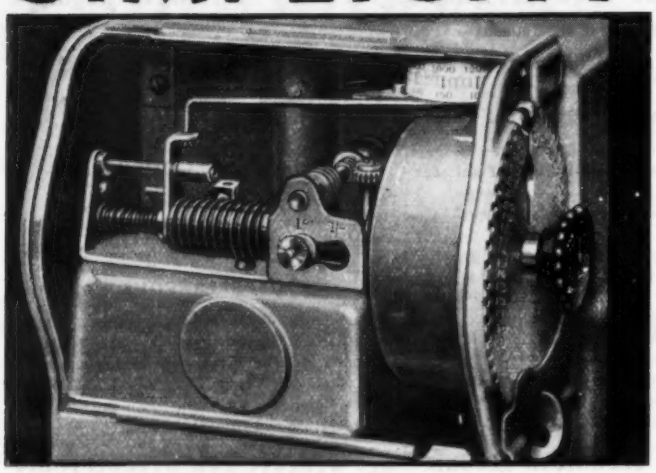

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THE GAS JOURNAL

DECEMBER 20, 1933

Vol. 204. 85th Year No. 3683

A Glance at the Contents—

Engineer and Manager Required.

An Urban District Council in Wales invites applications for the position of Gas Engineer and Manager, the salary offered being £400 per annum. [p. 844.]

Institution of Gas Engineers.

Further written contributions to the discussions at the Fifth Autumn Research Meeting of the Institution of Gas Engineers are published. [p. 823.]

Engineer and Manager Required.

The Padiham Urban District Council invite applications for the position of Engineer and Manager of their Gas Undertaking at a commencing salary of £400 per annum. [p. 844.]

Oven Coke for the Home.

Addressing a meeting of the Midland Section of the Coke Oven Managers' Association, Mr. H. O. H. Cerckel dealt with the subject of the manufacture of household coke in coke ovens. [p. 831.]

South-Eastern Gas Corporation.

Good prospects for the future were revealed by the Chairman of the South-Eastern Gas Corporation (Sir David Milne-Watson, LL.D., D.L.) at the first ordinary general meeting of the Corporation held last week. [p. 836.]

Improving Consumer Relations.

The B.C.G.A. have supplemented their Domestic Gas Salesmanship Course by providing a special training programme for fitters and maintenance men, directed towards the many non-technical, but nevertheless vital, considerations which colour the average householder's attitude towards gas and gas service. [p. 820.]

Derbyshire Company Requires Engineer and Manager.

Applications are invited by the Matlock and District Gas Company for the position of Engineer and Manager. [p. 844.]

Dry Purification.

We continue publication of the paper by Mr. W. A. Currie before the Public Works, Roads, and Transport Congress. The author deals with new methods of control of dry purification. [p. 837.]

Heating Horizontal Retorts.

The application of the tertiary air system of heating horizontal retorts was the subject of a keen discussion which followed Mr. H. J. Risby's paper before the London and Southern District Junior Gas Association. [p. 834.]

Duke of York Inaugurates Tottenham Plant.

The Tottenham and District Gas Company were honoured on Tuesday of last week by a visit from H.R.H. the Duke of York to inaugurate an installation of Woodall-Duckham intermittent vertical chamber ovens. [p. 822.]

Pneumatic Cleaning of Gas Coke.

Mr. C. W. H. Holmes, M.Met., describes the pneumatic process for cleaning gas coke in which the coke is floated by means of air instead of in water—a process not perhaps so well known in the Gas Industry as the wet system. [p. 827.]

Gas Lights Railway Station.

The approach road and all fourteen platforms of Temple Meads Station, Bristol, are being lighted by up-to-date gas installations, carried out by the Bristol Gas Company in conjunction with the G.W.R. Lighting Department. [p. 821.]

Forthcoming Engagements

Dec. 21.—I.G.E.—Meeting of Refractory Materials Joint Sub-Committee, 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

1934.

Jan. 4.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. T. Campbell Finlayson.

Jan. 5.—I.G.E.—Meeting of Meters Committee, 2.30 p.m.

Jan. 13.—SCOTTISH JUNIOR ASSOCIATION.—Joint Meeting in Glasgow.

Jan. 20.—WESTERN JUNIOR ASSOCIATION. — Meeting at Weston-super-Mare. Papers by Mr. K. G. Bodiley and Mr. K. L. Clark.

Jan. 26.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. W. E. Benton.

Feb. 1.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. E. L. Wallis.

Feb. 16.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. P. Lloyd.

Feb. 17.—SCOTTISH EASTERN JUNIOR ASSOCIATION.—Visit to Portobello Power Station. Paper by Mr. W. Masterton.

Feb. 22.—JUNIOR ASSOCIATIONS.—Joint Visit to British Industries Fair.

March 8.—MIDLAND JUNIOR ASSOCIATION.—Meeting. Paper by Mr. H. J. Reynolds.

March 10.—WESTERN JUNIOR ASSOCIATION.—Meeting at Plymouth. Paper by Mr. A. R. Langford.

March 16.—LONDON AND SOUTHERN JUNIOR ASSOCIATION.—Meeting. Paper by Mr. L. T. Minchin.

1933 "JOURNAL" Directory.

Page 58. SALTASH. T. E. White, E. & M., deceased.

Page 90. PITTENWEEM. C. Carlow appointed E. & M. vice A. B. Dunn, retired.

Page 92. TAIN. C. Carlow, M., resigned.

EDITORIAL NOTES

Medium-Temperature Carbonization

IN these columns a few weeks ago we emphasized that the Gas Industry must keep in touch with all developments of carbonization at temperatures lower than those it now employs to manufacture gas. There is an awakening to the merits of a smokeless atmosphere; and this is having its effect on the sales of gas and also on the sales of solid smokeless fuel. The importance of the coke market has never been universally appreciated by the Gas Industry; and as far as we can see we cannot afford to lose this market. There is a great potential demand for a fuel for the domestic firegrate which will possess the advantages of a good household coal, but shall be smokeless and be obtainable at a price about the same as that of coal. Who is going to satisfy the demand? Recently Dr. Koppers described in the "JOURNAL" the principles of medium-temperature carbonization and summarized the results of large-scale working over a period of two years at the plant of the Compagnie des Mines de Bruay. He stated definitely that the production in coke ovens by medium-temperature carbonization of a smokeless fuel suitable for the open firegrate is a proved economical proposition. The process he described consists in carbonizing in narrow ovens at 680°-720° C. a mixture of coking coal and preheated oxidized coal.

In to-day's "JOURNAL" Mr. H. O. H. Cerckel gives an account of medium-temperature carbonization of coal in ovens designed by the Lecocq Company—a process which does not incorporate preheating, and which, therefore, the author claims to be simpler and cheaper. The Lecocq Company's claim is to produce good household coke without pretreatment of some of the coal or blending with other coals. A full-size oven has been working at the Montrambert Collieries for over a year, dealing with poor local coals to which 10-20% of coke dust is added. The results were considered so satisfactory that a battery is being built, and some ovens are being erected at the New Brancepeth Colliery Company, Durham. Heating is effected by radiation and conduction, the oven wall being divided into three parallel sets of flues, a central one in which combustion takes place, and two narrow outside ones adjoining the coke. The walls are 50% wider than normal oven walls, and it is stated that existing ovens can be altered easily to this method of heating. For ovens intended to work at medium temperature only, the cost of the machinery, doors, buckstays, &c., is put at two-thirds that needed for high-temperature work, while the smaller flues and foundations will further reduce the cost. Also the bye-product recovery plant, for a given output of coke, is reduced in size. In view of the low price of blast furnace coke and the number of idle ovens and plants, this is of interest to the coke oven industry—and also, surely, to the Gas Industry. The author observes that the coal need not be crushed finer than in usual coking practice, and that the coke produced by carbonization at 700° C. contains 4-6% of volatile matter, is easily ignited, and will burn well in open grates. About twice as much tar is produced as with high-temperature carbonization, and this tar is an excellent raw material for hydrogenation. As for the gas produced, this has a calorific value, after being scrubbed for light oils, of 750 B.Th.U.; and on account of this relatively high calorific value Mr. Cerckel predicts a great future for it in a compressed state as a fuel for internal combustion engines.

Mr. Cerckel concludes his contribution by insisting that collieries should be the home of the "new industry" of providing a smokeless fuel for the open firegrates of this country and for export. We conclude this note by reiterating that the Gas Industry cannot afford to regard with complacency the attack on all sides of its present coke position.

Controlled Climate

DURING the Institution Tour in America, a good deal was heard on the subject of air conditioning, and thus special interest is lent to an account of Philadelphia's new air-conditioned home, by Larry Heiss, Display Director of the United Gas Improvement Company. This home, which was finished not very long ago, represents the first complete installation in Philadelphia of all-the-year-round residential air-conditioning by gas, and the description of it appears in the Display Bulletin of the American Gas Association.

In the construction of this model home there have been used solid sheets of cork insulation 1½ in. thick in all outside walls and the second floor ceiling, and rock wool around window and door frames and eaves. This method is said to assure at least 30% saving in fuel in winter, and extra comfort and coolness in summer. There is also a new type of single window sash having two panes of glass separated by an air space—an arrangement which reduces heat loss in winter and heat penetration in summer, and prevents fogging of windows on cold days. The conditioning plant proper consists of a simple, compact gas-operated unit occupying a specially insulated cubicle in the basement. This unit automatically treats the air, and distributes it throughout the house by means of a system of inconspicuous ducts.

In summer, the air is drawn through a filter and passed through a slowly revolving bed of dehydrating material (silica gel), which absorbs atmospheric moisture like a sponge. Ordinary tap water next reduces the temperature of the air to the desired degree, and it passes into a fan chamber from which the "conditioned" air is forced into the circulating ducts. The only difference between winter and summer air-conditioning processes is that in cold weather the air is first heated and humidified and in summer it is cooled and de-humidified. The entire heating and cooling system is controlled thermostatically, and operation of all equipment may be governed from a small bronze panel located in the stairway leading to the basement.

In the *Evening Standard* a few days ago, Basil Murray referred to the subject of air conditioning, which, he said, has been in existence in this country for twelve years, but in America it "has made more rapid strides, owing to the greater quantity of new construction." Large installations were instanced by him, but it is air conditioning for the home that we have been dealing with above; and as to this, here is what Mr. Murray had to say: "Air conditioning will inevitably spread. Already small sets for use in private houses are on the market, and are being sold on a considerable scale in the United States. In countries which experience the extremes of heat and cold, demand for domestic air conditioning is naturally keenest; but even in London many householders would welcome the opportunity of having an even temperature in their rooms, whatever the season."

And, as has been shown, "you can do it by gas."

Unemployment Grants

By a majority decision, the Master of the Rolls dissenting, the appeal of the Crown has been allowed by the Court of Appeal in the case of *Barnes v. Birmingham Corporation*, and the ruling of Mr. Justice Finlay in the King's Bench Divisional Court (to which reference was made in these columns on Sept. 13, p. 555) has been reversed.

It should be added that, while the Master of the Rolls, in a considered judgment, came to the conclusion that the ruling of Mr. Justice Finlay was correct, he expressly stated that he did not entirely accept the reasoning adopted by or the basis upon which the learned Judge arrived at a decision in favour of the Corporation. The principle involved was whether the words " actual cost " in Rule 6 (6) to Cases I. and II. of Schedule D to the Income-Tax Act, 1918, had the effect of limiting the aggregate annual wear and tear allowances (based, in accordance with Rule 6 (1) on the diminished *value* of the plant or machinery) to the total cost of the plant in question—*i.e.*, tramway tracks—or to the net cost to the Corporation—*i.e.*, after deducting a Government Grant authorized by the Unemployment Grants Committee and a contribution towards the cost made by the Dunlop Rubber Company, Ltd., in circumstances set out in the article already referred to.

The Attorney-General, for the Appellant Inspector of Taxes (representing the Inland Revenue Authorities), argued that Sub-Rule (6) definitely restricted the total allowances to such amount as was in fact borne by the taxpayer, and, in support, referred to the professed intention of the Finance Act, 1907, which sought to rectify the absence of such restriction (as evidenced by the decision of Mr. Justice Walton in the 1906 case of *Hall, Junior, & Co. v. Rickman* (1 K.B. 316)) in Section 12 of the Customs and Revenue Act, 1878. Counsel for the Respondent Corporation cited, in so far as the Unemployment Grant was concerned, the case of *Seaham Harbour Dock Company v. Crook*, 1931 (16 T.C. 333), and contended that the means by which the taxpayer met the cost involved in the replacement of tramway tracks was immaterial to the computation of wear and tear allowances, and that if once it were admitted that the " value " of the plant was to be reduced to " net cost," for the purposes of Sub-Rule (6), it would be difficult to know where the deductions should end.

In his judgment, the Master of the Rolls reviewed the " Rules " applicable to Cases I. and II. of Schedule D, and expressed the view that Sub-Rule (6), which restricts the total allowances, must be read as supplementary to Sub-Rule (1)—which enacts that the Commissioners may allow such deduction as they consider " just and reasonable as representing the diminished value by reason of wear and tear "—and that accordingly, and taking Rule 6 as a whole, it was not right to deduct these two adventitious sums (or " appropriations in aid," to use a Treasury expression) from the actual cost which ought to be taken as the outlay of the Corporation.

Lord Justices Slesser and Romer were, however, of the opposite opinion, and accepted the view that the use by the Legislature of the two different terms—" value " in Sub-Rule (1) and " actual cost " in Sub-Rule (6)—were intended to be in contradistinction, and that accordingly the decision of the Commissioners (which had been reversed by Mr. Justice Finlay) should be restored and the appeal of the Inland Revenue Authorities allowed with costs. If only for the reason that the ruling of the Court of Appeal will have the effect, in many instances, of indirectly nullifying the decision of the House of Lords in the Seaham case, it is to be deplored; moreover, it appears to enunciate the principle that it is competent for the Taxing Authorities to institute inquiries as to the source from which particular expenditure is financed, and to take into consideration what the learned Master of the Rolls appropriately referred to as an " adventitious asset." Much as we incline to the view that a taxpayer should not be compelled to bear the full brunt of the heavy expenses incidental to an appeal to the High Court (with the almost certain knowledge, in most cases, that, even if successful in his appeal, this expenditure will be regarded for income-tax purposes as a non-allowable deduction from profits), we should welcome an opportunity to see this matter adjudicated upon by the House of Lords.

The Coal Utilization Council

As readers are aware, last year the coalowners formed a Coal Utilization Council, and appointed a manager to stimulate by propaganda and other means the sale of coal at home and abroad. This " will to combine " on salesmanship stands in marked contrast with the inability of the owners to secure unanimity of view on other phases of mining administration—but that is by the way. The Council declare their wish is to work in co-operation with, rather than in antagonism to, the gas and electrical industries. But not all its members carry out the spirit of this laudable aspiration. Printed matter is periodically issued by coal factors in which gas appliances are openly attacked; not a very promising method of promoting co-operation. We will not judge these offenders of the co-operative spirit too harshly; perhaps they have misread the true purpose for which the Council was formed (*vide* its chief spokesmen), and will mend their ways as experience of its functioning widens. There are bound to be mistakes made in the initial stages, for co-operative selling by the coalowners in the form now being organized is quite a new thing.

In February last Mr. W. R. Gordon, Director of the Council, said at an official interview that its activities were not directed against gas. It would have prevented some initial misunderstandings if this had been made clearer in the brochure which set down the aims and policy of the Council. This makes no mention of " co-operation." There is this sentence: " It is essential the Council should have not merely the goodwill, but the active co-operation, of every person *engaged in the coal trade;* " it would have been better to have read " in the coal and gas trades." Again, in dealing with " Market Investigation " it is said the systems adopted by those who sell fuel of all kinds will be examined, and the sentence is used: " It is significant that the gas and electricity industries, which, although *in a sense competitors of coal* . . . have during the past few years developed highly efficient methods of salesmanship." A little further on this is followed by the observation: " The Council looks for the co-operation of the gas and electrical industries (as large consumers of coal) in meeting the competition of imported fuel." As concerning the Gas Industry, it also looks for the *co-operation of the coal industry*.

A token of willingness to co-operate was shown when the Coal Utilization Council last July circulated local authorities pointing out the shortcomings of " The Flueless House," following a deputation of the Council to the Ministry of Health. It was pointed out both to the Ministry and to local authorities (by circular-letter) that flueless houses, or those made with specially constructed and restrictive flues, were against public interest, because they deprived the occupier of free choice in the matter of fuel; were unhygienic, because they interfered with ventilation; and were calculated to injure the coal industry. These objections were amplified by concrete evidence. The letter to local authorities quoted the Minister of Health as having said in the House of Commons, in answer to a question, that he was " not prepared to approve of the erection by local authorities of houses in which a coal fire cannot be used in at least one room," and declared the Council's intention of pressing for coal fire facilities in bedrooms as well as living rooms. Local authorities in accord with the Coal Utilization Council's policy were asked to intimate that fact.

The National Smoke Abatement Society were somewhat perturbed by a Coal Utilization Council announcement in the Press of July 25, that an extensive campaign was proposed in favour of the domestic open coal fire. *The Times* account ascribed to Mr. W. R. Gordon, among other things, the observation that his Council were satis-

fied that the mass of householders and industrialists was greatly in favour of continuing the use of solid fuel, and his other remarks indicated the steps which were intended to see that the public's liking of coal did not flag. At an interview later, Mr. Gordon said misunderstanding had arisen from incomplete, and in some cases inaccurate, Press reports of his remarks, and that it was a recognized principle of the Council that, while stressing the advantages of solid fuel, their Press advertising must never degenerate into an attack upon gas or electricity. That is assuring, as far as it goes, and leaves no scope for criticism, since the boosting of its own wares is what every individual, firm, and industry indulges in. But the Council must also keep an eye upon the coal dealers and merchants, if they wish to preserve harmony with those ancillary industries that feed them with orders. Their advertising funds are drawn from the distributing as well as the producing section, and therefore the Council cannot escape being linked with any misdemeanour on the distributing side.

PERSONAL

Mr. W. H. JOHNS, Engineer and Manager to the Swansea Gaslight Company, has been elected Chairman of the South Wales branch of the Institution of Mechanical Engineers for the ensuing year.

* * *

Mr. I. G. JENKINS, who has been Engineer and Manager of the Abertillery Gas Undertaking for the past thirteen years, has joined the staff of Messrs. R. & A. Main, Ltd., and will represent the firm in the Bristol and South Wales areas, in succession to Mr. A. G. Barry, who has been promoted to the Head Office in London. Mr. Jenkins was President of the Wales and Monmouthshire Association of Gas Managers for 1932-33, and owing to the death of the President-Elect, Mr. Collins, of Bridgend, he has been asked to continue in office for another year. The Abertillery Urban District Council have reluctantly, and with regret, accepted the resignation of Mr. Jenkins and arranged for him to commence his new duties on Feb. 1. In view of Mr. Jenkins' long experience with the Abertillery Gas Undertaking the Council have unanimously appointed him to act in an advisory and consulting capacity for three months ending April 30 next.

* * *

Mr. D. L. COPP, who for the past five years has been Chief Assistant to Mr. W. M. Westlake, Engineer and General Manager of the Exeter Gaslight and Coke Company, has been elected an Associate Member of the Institution of Civil Engineers.

* * *

Mr. A. D. M. COOKE, Chairman of Catrine Gas Company, has completed 25 years in that position and has been presented with gifts by the Directors to mark the occasion. He is the only remaining member of the Board of 25 years ago.

* * *

The Aspley Guise and Woburn Sands Gas Company is now controlled by three new Directors who have for some years been closely connected with the Gas Industry, and Mr. ALFRED J. KINGDON is the new Chairman. The works are to be reconstructed and enlarged and the district is also to receive attention to cope with the increased demand for gas.

* * *

Mr. CHARLES CARLOW, Manager of the Tain Corporation Gas Department, has been appointed Gas Manager at Pittenweem in succession to Mr. ANDREW B. DUNN, who has retired. Thirty-seven applications for the post were considered. At the end of the war Mr. Carlow was appointed Assistant Manager at the Renton Gas-Works, and in 1928 he was appointed Assistant Manager to the Hoddeston Gas Company. He has been Manager at Tain for three years.

* * *

Mr. JAMES PATERSON, formerly Chairman of the Progas Company, Ltd., of 95, Belgrave Road, Westminster, S.W. 1, asks us to state that he has severed his connection with the Company.

OBITUARY

The death took place on Dec. 14 of Mr. EDWARD ONIONS, who retired recently from the position of Engineer and Manager of the Loughborough Corporation Gas Department after more than fifty years with the Undertaking. In December, 1931, congratulations were extended to Mr. Onions by the Town Council upon the completion of half a century's service; he had been connected with the Undertaking—both Company and Corporation—for more than half the period of its existence.

* * *

Mr. THOMAS EDMOND WHITE, who has been for seventeen years Engineer and Manager of the Saltash Gas Company, passed away at his home in Fore Street, Saltash, on Tuesday, Dec. 12, from pneumonia, at the age of fifty-five. Mr. White went to Saltash from Sherborne, Dorset, during the war. He was a member of the Saltash Town Council, to which he was elected two years ago, and served on the Ferry, Finance, and Rating Committees. He was on the Committee of Saltash Regatta and took an active part in the work of the parish church. He was one of the officers of Zetland Lodge of Freemasons at Saltash. As a young man Mr. White—who leaves a widow, son, and daughter—served in the Boer War. Reference to the loss the town had sustained by the death of Mr. White was made at a meeting of the Saltash Town Council on Dec. 12, when a standing vote of sympathy was passed and the Town Clerk was instructed to send a letter of condolence to the widow and children.

* * *

While out walking at Rothesay last week Mr. WILLIAM JOHNSTON, who for 30 years was Secretary of the Coatbridge Gas Company, collapsed and died.

CORRESPONDENCE

Moisture in Coke

SIR,—It is generally agreed that if coke is to make any headway in the domestic market the first essential is quality—it must be carefully graded, have a low ash content, ignite readily, and burn brightly. The quality of easy ignition is said to depend chiefly on its proportion of volatile matter and its freedom, or comparative freedom, from moisture. This is what one would naturally expect, but high carbonizing temperatures and correspondingly high thermal yields of gas are incompatible with volatile matter in more than negligible proportions. Reversion to lower temperatures being out of the question, it remains to be seen whether it is feasible and, if feasible, also economical to increase the volatile matter by artificial means. There is, however, no reason why coke should not conform to the second condition—*i.e.*, comparative freedom from moisture. Most quenching plants can be adjusted to bring this about, but my experience leads me to wonder whether dryness up to a point has really so very much to do with easy ignition or ready burning of coke.

The coke supplied by my Company during the last two or three years has been exceptionally dry, but in spite of this there have been more complaints from domestic consumers since the change than ever before, and *this is the point of my letter:* Many of those who complain have found, either on their own initiative or after having been advised by others, that the coke was vastly improved by being drenched with water. One customer who used to store coke under cover to keep it in a dry condition now stores it in the open and asserts that this method of storing, with a little artificial rain in the very dry weather, improves the coke. I have heard this point of view so often that it has constrained me to write to you hoping that some of your readers may be induced to give their views on the matter. I am sure my experience is not an isolated one, but I have no recollection of ever hearing this seeming anomaly explained or demolished.

In the meantime permit me to sign myself

Yours, &c.,
"IMPROMPTU."

Dec. 13, 1933.

THE NEWS OF THE WEEK

Advertising on Omnibuses is being adopted to a wide extent in Lincoln, where the Gas Department have various slogans on nineteen of the Corporation's public service vehicles.

The Output of Gas from the Belfast Gas-Works for the week ended Dec. 13 made a new record for the city. The total was 110,073,000 c.ft. The previous best was 109,152,000 c.ft. for the week ended Jan. 7, 1931. The Gas Committee have expressed their appreciation of the growing demand.

Gas Production in Austria.—The report on the activities of the municipal gas undertaking of Vienna during 1932 shows that, despite an increase in the production of 0·65%, the sales of gas during the twelvemonths only amounted to roundly 10,308 million c.ft. as compared with 10,871 million c.ft. in 1931. The decline of 4·87% is attributed to two main causes—the industrial depression and the mildness of the weather in the autumn and winter months.

Price Reduction.—The Wells Gas Light Company announce that the price of gas will be reduced as from Jan. 1, 1934, after which date a block system of charges will be brought into operation. At the same time the declared calorific value will be increased from 450 to 475 B.Th.U. per c.ft. The first 5000 c.ft. will be charged at 1s. 1·26d. per therm, the next 15,000 c.ft. at 1s. 0·94d. per therm; the next 30,000 c.ft. at 1s. 0·63d. per therm; the next 60,000 c.ft. at 1s. 0·2d. per therm; and the next 120,000 c.ft. at 11·78d. per therm. These prices apply to business and domestic purposes. For power, the first 5000 c.ft. will be at 11·36d. per therm; all additional at 10·1d.

Visit to the Davis Works at Luton.

About 130 members of the Cambridge University Engineering and Aeronautical Society visited the Davis Gas Stove Company's Works at Luton on Dec. 6. The Society is composed of undergraduates studying engineering, as well as of Professors, Lecturers, &c.

After being entertained at lunch, the visitors were shown round the works. Accustomed as the members of the Society are to visiting various works in the country, their great interest in the efficient organization and modern equipment of the works is in itself a striking tribute to the Davis organization.

Nor are there wanting personal links between the Davis Works and the University of Cambridge. Three of the sons of Mr. Harold N. Davis (Chairman of the Davis Gas Stove Company, Ltd.) were at Trinity College. The eldest, Kenneth, who, as a Director, now assists his father, took an honours degree in Engineering. The second son, Leslie, took an honours degree in Modern Languages, and is now in the Malay Civil Service. Laurence took the Engineering degree and has recently gone into the works with his father and brother; while the youngest son, Peter, is taking his entrance examination for Trinity College in the spring of 1934.

Chelsea Polytechnic Prize Distribution.

A large and enthusiastic gathering filled the great hall at Chelsea Polytechnic on Dec. 5, when Viscount Leverhulme presented the diplomas and prizes for the Session 1932-33, and received the students who had graduated or obtained higher degrees at the University of London during that Session.

The laboratories and studios throughout the building had been open to inspection before the ceremony in the hall. Most of the visitors took the opportunity thus afforded of seeing the equipment and accommodation provided by the Polytechnic for its work in Science, Technology, and Art.

Mr. C. H. St. J. Hornby, Chairman of the Governors, presided and he was supported by Sir William Furse, Sir Edmund Phipps, Viscount Sandon, Mr. Eric Hall, Mr. Reginald Blunt, Mr. Blake, and Mr. Melhuish.

Dr. F. J. Harlow, the Principal, in his report, stated that, notwithstanding the acute depression of the past year, the work of the Polytechnic as regards students, student hours, and the number and character of the successes at examinations again showed an advance. He referred to a recent visit to the Continent during which he had been able to see something of the technical education of five countries, and expressed the conviction that England had much to learn in the matter of co-operation between industry and education. In his opinion there was just as much need for rationalization in the relationship between industry, commerce, and education as there was in industries and commercial undertakings.

Viscount Leverhulme congratulated all who had earned distinctions and thus brought credit not only on themselves but also on the Chelsea Polytechnic. A recent tour of the building had given him some idea of the work that they were doing. Remarking that the Polytechnic was chiefly devoted to science and art, he said that science taught them a scientific attitude of mind and thought, which could be valuable assets in industry and commerce. Often when a man had graduated in science he found himself in some branch of industry or commerce where that scientific knowledge was of the greatest possible use, giving him a mental equipment which he was able to bring to bear on commercial problems. There was an increasing realization that industry and education must be brought closer together, and that all reasonable facilities and encouragement should be given by directors of companies to the junior members of their institutions so that they could equip themselves not only for the jobs they had to do, but for the lives they had to live. He reminded the students that their careers would entail a human as well as a technical side, and they had to learn not only how to work for others, but with others. They must practise the art of give and take and learn to work as part of the team.

Physical Society's Exhibition.

The twenty-fourth annual Exhibition of Scientific Instruments and Apparatus, arranged by the Physical Society, will be held on Jan. 9, 10, and 11, 1934, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, S.W. 7.

The leading manufacturers of scientific instruments will be exhibiting their latest products in the Trade Section. The Research and Experimental Section will contain contributions from most of the important research laboratories in Great Britain, and there will be a special sub-section devoted to experiments of educational interest. In addition, the work submitted for the Craftsmanship Competition by apprentices and learners will be on view.

Members of Institutions and Scientific Societies may obtain tickets from their Secretaries. Tickets may also be obtained direct from the Exhibition Secretary, 1, Lowther Gardens, Exhibition Road, S.W. 7.

Sheffield Gas Company's Club.

The Sheffield Gas Company's Club was inaugurated, and the premises were officially opened, on Dec. 7, by the President, Mr. Ralph Halkett, General Manager and Secretary of the Company.

There was a large attendance of employees, and the gathering was presided over by the Chairman of the Club's Management Committee, Mr. Ralph Halkett, Jnr., Assistant General Manager of the Company, who was supported on the platform by other Members of the Committee, some of whom were Mr. H. Chamberlain, Engineer; Mr. L. Watson, Chief Accountant; Mr. W. McCullock, Chief Clerk; and the Treasurer of the Club, Mr. J. T. Meakin, Cashier.

The premises are situated in the centre of the city and

THE NEWS—*continued.*

are in close proximity to the Company's Head Offices. Facilities for all kinds of games are provided, including a handsome billiards table which is a gift from the Directors. The Club is licensed to sell tobacco, &c., but not for drink; refreshments are provided at very moderate charges by the steward of the Club.

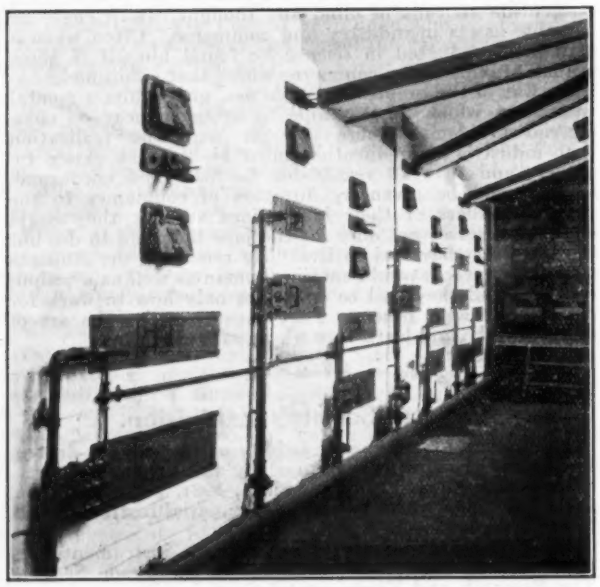
In declaring the Club Room open, Mr. Ralph Halkett extended a hearty welcome to all present and said that he hoped full use would be made of the Room. He regarded it as a valuable acquisition which he was sure would help to increase the spirit of comradeship and co-operation which already existed among the employees.

On behalf of the employees, Mr. Sydney Unwin expressed thanks to Mr. Halkett, and through him to the Directors of the Company, for placing such a splendid means of recreation at their disposal, and said they particularly wished to express their appreciation to Mr. Halkett, Jnr., for initiating the scheme and for carrying it through to fruition.

After Mr. Halkett had played the first ball on the billiards table the company proceeded to take part in the various games provided.

This Club is in addition to the Sheffield Gas Company's Sports Club, which has been in existence for many years. The playing fields are adequately laid out on part of a farm which belongs to the Sheffield Gas Company, there being facilities for cricket, football, tennis, and bowls. A good pavilion is also provided at the sports ground for employees taking part in the various sports.

Gas Displaces Oil.



This photograph, kindly forwarded by Mr. James Mitchell, Engineer and Manager to the City of Leicester Gas Department, is of a recent gas conversion of seven baking ovens at a large bakery in Leicester. The ovens were previously heated by oil, and since the change-over the owners have expressed satisfaction with the working under the new conditions. The conversion unit was designed by the Leicester Gas Department, and the entire work was carried out by the staff.

Visit to the Works of Messrs. Thomas Glover.

On Dec. 6 members of the Manchester and District Junior Gas Association assembled at the Manchester Works of Messrs. Thomas Glover & Co., Ltd., and were received by Mr. R. Scott and Mr. A. G. Wilson. They were conducted around the works by members of the technical staff and were shown the various processes of the manufacture of dry meters, both ordinary and prepayment, the latter comprising the standard and high-capacity types. The two-coin consumers' optional was of special interest on account of its simplicity.

After the inspection of the works Mr. A. Forshaw, M.Sc., of Messrs. R. & A. Main, Ltd., showed a three-reel film illustrating the firm's works, fitting shop, and foundry at Falkirk.

Mr. A. W. Sharman, of Messrs. Thomas Glover, then gave an address on "The Working of a Dry Gas Meter."

The members were afterwards taken into Manchester, to the Grand Hotel, for Dinner.

Votes of thanks to the firm, guides, and the lecturer were given by Messrs. J. Carr and J. Graham, and were responded to by Messrs. Scott and Wilson.

Gas Company Seeks Powers to Supply Gas for Heating and Cooking.

Mr. Justice Megaw in the Ulster Chancery Court on Dec. 11 deferred his decision in the application of the Carrickfergus Gas Company for sanctions to extend the powers of the Company so as to enable it to provide gas for heating and cooking purposes.

Counsel for the Company said the application was to alter the form of constitution. The Company was founded by deed of settlement dated Nov. 9, 1854, and was under the then existing Joint Stock Companies Act of 1844. The Company was registered for the manufacture and sale of gas for lighting the streets and buildings in the town and vicinity. It was thus restricted, and owing to the headway that had been made gas for heating was now a very important part of the work of gas companies.

Permission was also sought to enable the Company to invest capital in other companies existing for a similar purpose. In connection with the latter application his Lordship desired to look into precedents.

Tar-Surfaces and Road Safety.

Mr. R. G. Clarry, M.P., Executive Chairman of the British Road Tar Association, presided last week at a dinner at the House of Commons when road safety was discussed.

He said that tar was an all-British product, and it was generally agreed that tarmacadam presented a perfect non-skid surface throughout its life. In a city it might be that asphalt was a harder-wearing material. What motorists desired, however, was a surface on which they could depend. Provided a tar surface was sprinkled with chippings of the requisite size and rolled in at the right time of year, not necessarily in the early spring but preferably later, when the foundation was warm, there was no reason why tar should not be 100% efficient.

On the Continent the majority of roads were being laid with this surface, and there was a constant demand for the British material.

A New B.C.G.A. Service to the Industry.

Improving Consumer Relations.

To the average consumer, the most frequent and best remembered contact with the gas undertaking is the man who installs the gas appliances and maintains them in effective working order. In the consumer's eyes he *is* the undertaking, and by his success or failure in earning appreciation and confirming goodwill, the entire attitude towards gas in general and the local undertaking in particular is established.

This unquestionable fact lends interest to the enterprise of the B.C.G.A. in supplementing their Domestic Gas Salesmanship Course by providing a special training programme for the grades of employees in question. It is not primarily a technical course—the majority of fitters and maintenance men already possess a reasonable technical proficiency—but it is directed towards the many non-technical, but nevertheless vital, considerations which colour the average householder's attitude towards gas and gas service. In other words, just as the B.C.G.A. Salesmanship Course was built fundamentally upon the conception of "selling from the consumer's point of view," so this new programme is a practical treatment of the related subject of service from the same angle.

In its original inception the scheme was planned as a service to those undertakings whose organizations do not include a "sales" staff, and whose business-getting activi-

THE NEWS—continued.

ties are conducted as opportunity arises by the technical members of the distribution staff. It became evident, however, that the need for establishing better " consumer relations " was not confined to such undertakings, and that, the influence of good—or, unfortunately, of bad—service makes a material difference to present progress and future possibilities even in the cases of undertakings where an extensive sales organization exists.

The aim of the new training programme, therefore, may be stated as being to show the installation and maintenance staff how to carry out their duties in such a way as to earn the appreciation and approval of the householders with whom they are brought into daily contact. Its preparation was entrusted to Messrs. Harold Whitehead and Staff, the compilers of the original B.C.G.A. Salesmanship Course, who were assisted throughout by a strong Committee of the Association. The Scheme is now launched and can be applied in any undertaking from now onwards.

In order to make the strongest possible appeal to those whom it is designed to benefit, it was decided to adopt a more definitely " personal " presentation, and the training is therefore presented in the form of a series of six fortnightly addresses, of a thoroughly informal type, by experienced lecturers who are familiar with the consumer's " angle " on the various problems of the Industry, and with the types of men of whom their audiences for this purpose will consist. Supplementing the addresses, each trainee is provided at the end of the series with a bound digest of the entire course for purposes of reference or re-study.

These addresses are founded on certain basic considerations which have been proved in practice, and the acceptability of which to the consumer has been confirmed by careful inquiry. At the same time they are built up in a sufficiently flexible form to permit in any given case of the special development or emphasis of any particular policies or needs of the undertaking concerned. They are eminently practical, not merely stating rules or principles, but explaining in detail, and in acceptable language, just how to carry out the various phases of the trainees' duties to the satisfaction of the consumer.

The comprehensive scope of the series is sufficiently indicated by the general titles of the six addresses, which are as follows:

Service and its effect on sales,
Installation that makes satisfied consumers,
Maintenance and inspection from the Consumers' viewpoint,
Your relations with the consumer,
The right use of opportunity,
Co-operation for still greater success,

and under each of these titles the consumer's attitude towards the trainees' activities is analyzed in detail and the right technique for maintaining satisfactory consumer relations is carefully explained. Each address is illustrated by authentic accounts of actual incidents within the compilers' knowledge, and still further to personalize the training a period for questions and informal discussion follows each address.

It is the aim of the Association to make this service available as far as possible to all its member undertakings even though in certain cases the fitting and maintenance staff may be numerically small. Plans have been drawn up, therefore, to include the provision of combined study centres at convenient localities, where the staffs of neighbouring undertakings, not large enough to maintain a centre of their own, can combine in this valuable programme.

Railway Station Lighting

APPROACH ROAD TO TEMPLE MEADS STATION, BRISTOL, LIGHTED BY GAS.

Temple Meads, the Great Western Railway Company's principal Station at Bristol, is being entirely reconstructed. The whole of the platforms (14 in number) and the approach road leading to the Station are being re-lighted with gas. This work is being carried out by the Bristol Gas Company, in conjunction with the Railway Company's Lighting Department.

The approach road has already been completed and the new installation consists of sixteen 6-light upright " Rochester " lamps, mounted at a height of 18 ft. The flat type of enamelled steel reflector is used, and each lamp is clock-controlled.

Work on the platforms is in hand, but this will not be completed until some time next year. About 250 3 and 4 light No. 1 " Littleton " lamps, each fitted with a special type of hexagonal opal dispersive shade, will be employed. Photometrical tests show that this shade, which was designed by the Great Western Railway Company's Lighting Department, gives a substantially increased illumination over the standard type of reflector.

The mounting height of the lamps from the platforms to the mantles will be 11 ft. and the spacing 30 ft. centres between lamps. Distance control device is being installed for operating the lamps in groups.

It is the Railway Company's intention to make Temple Meads one of their best lighted Stations, and a scheme is being considered for permanently floodlighting the front of the main building in the approach road. In addition to lighting, gas will be used for cooking purposes in the restaurant.

H.R.H. the Duke of York at Tottenham

Inauguration of New Woodall-Duckham Plant

The Tottenham and District Gas Company were honoured on Tuesday of last week by a visit from H.R.H. the Duke of York to inaugurate at the Willoughby Lane Gas-Works an installation of Woodall-Duckham intermittent vertical chamber ovens—fully described and illustrated in last week's "JOURNAL."

His Royal Highness was met on arrival by Mr. Henry Woodall (Chairman of the Company) and Mr. H. C. Smith

H.R.H. the Duke of York inspecting a pipe threading machine in the fittings shops of the Tottenham and District Gas Company.

(Chief Engineer), after which he inspected the Company's private fire brigade, ambulance brigade, and rescue corps. He then proceeded to the new power house, where he was introduced to other Directors and officials of the Company and a number of distinguished guests, including Mr. Henry Bailey (Deputy Chairman), Mr. A. E. Broadberry, Mr. W. A. Surridge, Mr. Thomas Goulden, and Mr. E. C. Woodall (Directors), Mr. E. J. K. Fussell (Secretary), Sir David Milne-Watson, LL.D., D.L. (President of the National Gas Council), Sir Francis Goodenough, C.B.E. (Executive Chairman of the B.C.G.A.), Mr. F. P. Tarratt (President of the Institution of Gas Engineers), and Mr. F. B. Richards (Chairman) and Mr. G. J. Jackson (Managing Director), of the Woodall-Duckham Company.

A MODEST SERVANT OF THE PUBLIC.

Before asking their Royal visitor to inaugurate the new plant, Mr. Henry Woodall said how very grateful they were to His Royal Highness for coming there that day.

The Gas Industry, said Mr. Woodall, had often been referred to as the Cinderella of Industries; why he did not know, but perhaps because she had been for many years a patient and modest servant of the public. Be that as it may, to-day a Prince had smiled upon them, and they, like Cinderella in the fairy story, felt all was well, and they would go forward with their work with more keenness and enthusiasm owing to this encouragement.

The primary reason for His Royal Highness's visit was to inaugurate their new carbonizing plant. It was the latest and, he believed, would prove to be one of the most efficient plants in the Kingdom. Those of them who remembered retort houses fifty years ago realized what a vast improvement there was in the conditions of labour in them to-day. The only drawback to modern plants was that with them more work was done by fewer men. It must not be forgotten, however, that they had spent £125,000 on the new plant, which had meant the employment of a large number of both skilled and unskilled labourers.

With his great knowledge of, and his personal interest in, the welfare of the workers of this country His Royal Highness would be glad to know that, though on the manufacturing side of their business they were employing fewer men, on the distribution side they were employing more. New consumers were added day by day, and they had more apparatus and consequently needed more attention. The net result was that the number on their wages roll was steadily increasing.

Mr. Woodall referred to the Company's varied welfare services the adoption and success of which had developed from, and was largely due to, their Co-partnership Scheme, inaugurated in this Company in 1908 by his father, the late Sir Corbet Woodall, the then Chairman of the Company.

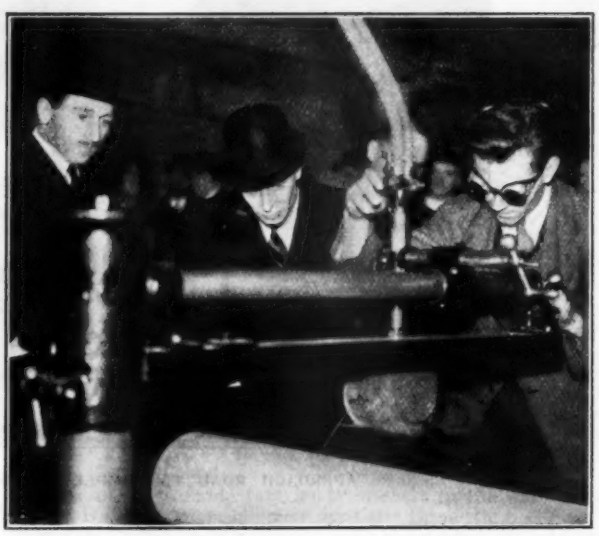
After the inauguration of the intermittent vertical retort plant they hoped that His Royal Highness would walk through the works. They then proposed to take him for a ride in a lorry driven by compressed gas. This lorry was the first vehicle to be put upon the streets in England run by compressed gas. They were a little proud of the fact and were hoping that the use of compressed gas for this and other purposes would extend. The ride would be a very short one—to their recreation ground, the amenities of which were fully appreciated by the workpeople and the staff.

Mr. Woodall then asked His Royal Highness to accept a pencil case, with the hope that when he used it, it might sometimes remind him of that day, when he gave a great deal of pleasure to a large number of people.

IMPRESSIVE ACHIEVEMENTS.

H.R.H. the Duke of York thanked them for the warm welcome they had given him. Being, as they knew, vitally interested in industry he could not fail to be impressed by the achievements of their Company, not only on the mechanical side but on the personal side. He had heard with the greatest interest of their co-partnership scheme and of the thought and outlay which they had expended on behalf of those who had worked for them. He congratulated the Company and wished them every success in the future.

His Royal Highness then formally inaugurated the new carbonizing plant by operating a lever which emptied a truck of coal by means of a rotary tippler and by discharging one of the ovens. He was then conducted over the new plant, including an ascent by lift to the charging stage, and the chief features of the installations were outlined to him. After inspecting the chamber oven plant, the Duke toured



Another photograph of the Duke of York interested in a piece of machinery in the Tottenham Company's fittings shops.

a portion of the works. He evinced keen interest in the first-aid dressing station, and took home with him a sample bottle of a special antiseptic which the Company use instead of iodine. He was also particularly interested in the fitting shop, where he saw a demonstration of pipe jointing and caulking.

THE DUKE TRAVELS IN GAS DRIVEN LORRY.

His Royal Highness finally inspected the Tottenham Company's compressed gas driven lorry, by which he was conveyed to the Company's recreation ground nearby, where he was entertained at tea in the Club House.

Cokes in the Open Firegrate

Written Contributions to the Discussion of Report on the Behaviour of Cokes in the Open Grate presented at the Fifth Autumn Research Meeting of the Institution of Gas Engineers.

Mr. R. A. Mott (Department of Fuel Technology, Sheffield University): I have followed with interest and pleasure the various reports from the Department of Fuel Technology of Leeds University, which have increased our knowledge of the factors concerned in the much-abused terms " reactivity " and " combustibility " in reference to coke. The important work which has been done earlier by Mr. Hodsman and his collaborators in the use of coke in open grates has rendered a signal service to those interested in this subject, and the present report adds further to our knowledge. Mr. Hodsman deserves great credit for the assiduity with which he has pursued this subject and unravelled some of its complexities.

Our own work has shown that the importance attached by many writers to the reactivity of coke in relation to its use in blast furnaces has led to much misconception, and specific reactivity of coke appears to be of little moment at the tuyères of a blast furnace, where no difficulty of ignition occurs and the temperatures are so high. In the open grate the importance of " reactivity " cannot be doubted, and I have followed with great interest the application made in the report of the laboratory tests which measure the ignition temperature of coke, its reactivity to oxygen and carbon dioxide.

Rank of Coal.

I am inclined to think that the authors sometimes attach to the " bulk density " of cokes a significance which is not entirely justified, while it is clear that they do not take sufficient account of one important factor, namely, the rank of the coal from which the coke was made. Our own work on coals and cokes has shown that the reactivity of coals (measured by reaction with alkaline permanganate), and of the cokes made from them, are higher the lower the rank of the coal, measured, for example, by the carbon content of the dry, ash-free coal. Thus high rank Durham coals are less reactive than lower rank Yorkshire coals, and Nottinghamshire and other coals are of still lower rank and reactivity. The same rule applies to the coals made from the cokes. I suggest that this factor has played a part which has sometimes been attributed to " bulk density." For example, the lower reactivity of some horizontal retort cokes, attributed to higher bulk density, is probably due, at least in part, to the use of high rank Durham coals. The higher reactivity of vertical retort cokes, attributed to lower bulk density, is due, in part at least, to the fact that such cokes are made from lower rank coals than are used in horizontal retorts. The origin of the coal is not always given, but the vertical retort cokes Nos. 1, 4, and 5 were made from West Yorkshire and Nottinghamshire coals, of lower rank than Durham coals, and were found to require more gas for lighting and produced little CO in the fuel bed. The intermittent vertical chamber coke No. 12 was also made from Durham coal and was found to require much gas for lighting, and gave other evidences of low reactivity, which cannot be ascribed only to high bulk density. Of the horizontal retort cokes, No. 10 was made from lower rank Nottinghamshire coal and No. 11 contained some low rank non-coking coal. These cokes required no more gas than the vertical retort cokes.

I should like to have the authors' opinion for the reason why cokes behave differently in the two types of coke grate tested. On p. 39 the authors, in referring to coke No. 18, a West Yorkshire oven coke, say that " it would not have given good results in a vertical faced grate." Actually, reports are given in Table VIII., p. 48, which show that in a vertical faced grate this coke gave a markedly higher radiation than vertical retort, horizontal retort, or intermittent vertical chamber coke over most of the period reported.

Finally I should like to compliment the authors on the brilliant application of the systematic work on the reactivity of coke carried out at Leeds, which has resulted in the discovery of a simple method for giving cokes a more reactive skin.

Ease of Ignition.

Mr. J. S. Hales (Fuel Research Station): I have listened with great interest to Mr. Hodsman's Summary of the Report on the Behaviour of Cokes in the Open Grate and the resulting discussion, and having been engaged on similar tests at the Fuel Research Station for some years past I should like to indicate a few points on which my experience differs from that of the authors.

For instance, pp. 6-13 are concerned with correlations of reactivity and ignition temperatures with combustibility and ease of ignition in the open grate. Many attempts have been made in the past to obtain a relationship, but, as in the present series of experiments, without success. This is not surprising when it is considered that ease of ignition is influenced, among other things, by the density, structure, volatile content, and shape of the fuel, as well as the draught through the fuel bed (which is varying continually). Again, reactivity values are determined at a comparatively high constant temperature, and it is not to be expected that the hourly output of radiation from an open grate would bear a very close relationship to it, since the reactivity varies rapidly with temperature while the output of radiation is influenced by all the physical properties of the fuel—*e.g.*, density, structure, strength, &c.—as well as chemical constitution—*e.g.*, volatile matter, and ash—many of which variables are left out of account in reactivity determinations.

Where it is required to obtain information only from the practical point of view on the burning characteristics of a fuel, it is undoubtedly easier and more satisfactory to carry out a fire test; nothing more than a very simple test is necessary to give adequate information.

The importance of the nature as well as the actual quantity of ash in a solid fuel is rightly stressed in the Report; the colour of the ash is also important from the householder's point of view, as the appearance of open fires is impaired by a light-coloured ash, which is also more noticeable in the room, as small quantities of ash frequently find their way on to the furniture.

The statement is made on p. 15 that " Cokes with a high bulk density are more difficult to ignite." Easy ignition is stated to be due probably to the low thermal conductivity of highly cellular coke. Although this may be true to a certain extent, it must be remembered that the heat capacity (derived from the specific heat and density) of coke is proportional to its density, and, for a given supply of heat for lighting, the less dense coke will reach a higher temperature in a given time.

Tests are described on partly burnt cokes (cinders) and, as has been found at the Fuel Research Station, these may be easier to ignite and more free burning than the original cokes. This is stated to be a direct result of a fall in bulk density. The experiments at the Fuel Research Station have shown that the improved ignition and combustibility are largely due to the breaking down of the coke cell walls by partial combustion, which allows a freer circulation of air and hot gases throughout each piece of coke. This may easily be verified by testing the coke for open pores by immersion in water; thus a medium density coke which floats in water gives a partly burnt coke which readily sinks and allows water to permeate throughout its mass, thereby showing the presence of a large number of large diameter open pores.

Shape and Structure of the Fuel.

Concerning the relationship between properties of cokes and radiation of heat, it is concluded that since radiation of heat depends upon the formation of red-hot cavities in the fire, the shape and structure of the fuel has an important bearing on its heating performance.

The statement is made (p. 21) that " Fuels which are dense, compact, of regular geometrical form tend to pack closely in the grate. On the other hand, fuels with a coarsely spongy character and irregular or angular form which do not pack closely, tend to give high outputs of radiation. . . . There is no obvious way of measuring this property, but it is certainly connected with bulk density."

This conclusion does not appear to be sound, since many of the high-density horizontal retort and chamber oven cokes have a far more irregular form than most low-density low-temperature cokes.

With regard to the effect of volatile matter, since in the Report it is stated that the flames from volatile matter are ineffective as a source of radiation, it is apparently not realized that these flames assist combustion by increasing the draught through the fuel bed, as may be seen by placing a piece of coal on a coke fire and observing the increased brightness of the fuel beneath it.

In dealing with the " effectiveness " of a fuel, the authors calculate a quantity " P " for each coke from the " equivalent weight of fixed carbon consumed per hour " and the bulk density and this is supposed to represent the " effectiveness of a fuel in a given grate as a source of radiation."

As already mentioned, bulk density by itself is an unreliable guide to the area of glowing cavities in a fire, and it is found that a slightly better relationship exists between the quantity " P " and the mean hourly rate of radiation if the bulk density factor is omitted altogether.

The quantities of heat used for ignition of some of the cokes, particularly low-temperature cokes, appear to be excessive. Thus, 10·5 c.ft. of gas (calorific value not stated) is used to ignite a low-density low-temperature coke containing 10% volatile matter, this being only about 2-3 c.ft. less than that required for some of the high-temperature cokes. Experiments at the Fuel Research Station have shown that a good low-temperature coke can be lighted with 2 c.ft. and if it is found necessary to give more than 4 c.ft. of gas (560 B.Th.U. per c.ft.), then difficulty is experienced in lighting a similar fire with wood and paper, as would be done in most cases. It would appear that there must be some considerable defect in the method employed at Leeds for the determination of heat for ignition.

Concerning the authors' method of increasing ignitability of coke by spraying tar and pulverized coal on to high-temperature cokes, the figures and curves reproduced do not show a very marked improvement of the treated cokes over the untreated cokes, considering that the volatile matter of the treated coke is increased to 4%. If 8 c.ft. represents the smallest volume of gas which can be used with the treated cokes, it will still be impossible to light such cokes with a normal quantity of wood and paper.

In conclusion, I should like to say that this is a subject which is of increasing importance to all who supply or consume solid fuels in open grates, and the thanks of all are due to the authors for their interesting and valuable contribution.

Ash Content.

Mr. R. J. Restall (Stalybridge): From observation that I have made, it has been found to be very important to have low ash content where there is likely to be 5% or over of moisture; if ash is not low, there is perceptible spluttering in the case of the moisture being higher. This remark, of course, coincides with those in the Report on p. 14, and is the outcome of three years' observation on dry cooled coke burned in an ordinary kitchen range having at the rear a domestic hot water boiler.

In regard to bulk density, some importance may be attached to this aspect of coke, but if careful attention is given to keeping the lower part of the grate open and well supplied with air, it has been found that the densest cokes as produced from washed coking slacks in horizontals give good results in quite ordinary grates.

I enclose herewith details of the sale of graded coke for domestic use, and from our experience in Stalybridge during the last nine months I believe that, provided coke is of low ash content and dry, there is a field for its sale equal to 85% of the coal sales of the majority of towns. I must amplify my remarks here by adding that to obtain a comfortable fire for ordinary grate use it has been found necessary to add 10-15% of coal to the coke; where, however, there is a good draught, no coal addition is necessary.

It is a very difficult problem to decide whether or not to push the sale of gas or coke having regard to our desire to supply gas for warming purposes; this, however, is a problem which will be partially solved by the wealth of the individual districts.

There will always be those who require a cheap fuel and, although in some places it is cheaper to burn gas than coal, as people realize the benefit of a smokeless atmosphere, gas and coke will ultimately be used to the entire exclusion of coal.

Figures Showing the Increase in the Sale of Graded Coke in 1933, Attributable Mainly to Domestic Use.

—	1932-33.	1933.
	T. C. Q.	T. C. Q.
April	26 0 0	42 5 0
May	14 18 0	48 10 0
June	8 10 0	33 13 0
July	5 16 0	33 0 0
August	8 10 2	43 8 0
September	14 11 0	42 12 0
October	15 12 0	79 10 0
November	24 3 0	..
December	22 14 0	..
January	34 13 0	..
February	25 9 2	..
March	27 18 0	..

Note.—During this period the number of customers increased from 70 in April, 1932, to 325 in October, 1933, largely owing to canvassing, advertising, and serving coke to domestic consumers in small quantities.

Importance of Fuel Size.

Mr. T. P. Carr (The Yorkshire Coking and Chemical Company, Ltd.): One point which I think the authors have not brought out very clearly—and one which is of immense importance—is that regarding the size of the fuel, which is most important for every kind of stove the coke is used for. We are repeatedly called to complaints, and on investigation the trouble is invariably due to an incorrect size being used. For instance, if the size is too large either in a furnace or an open grate, the fire will not keep alight.

Another point that has not been dealt with is the question of air area presented to the coke in the grate. This, of course, is a most important matter, and one where the chief secret lies in burning coke.

Mr. Hodsman's Reply.

Mr. H. J. Hodsman: Mr. Restall's query as to the wisdom of " pushing the sale of gas or coke " is fundamental and widespread, if not always vocal. The results of the tests reported may offer guidance, for they show that the solid fuel fire can occupy a market—*i.e.*, for continuous heating by radiation—which the normal gas fire consuming gas at current prices can barely enter. It may be inferred that gas and coke fires are complementary rather than competitive appliances. Again, if a smokeless solid fuel is to weigh 25 lbs. per c.ft. or less, its distribution can find occupation for everyone now engaged in the distribution of coal, and their co-operation can reasonably be sought.

We do not share Mr. Roberts' preference for the word " combustibility " which we find difficult to define—if definition is possible. The word " reactivity " as used by us has a precise meaning—on the Key-Cobb scale the numbers have the meaning of reaction velocity constants of the reduction of CO_2 by carbon. Reactivities to oxygen cannot be stated in the same way, but we avoid confusing the two. We think that these terms are often misused because—as emphasized in the Report—chemical reactivity is not solely determinative of behaviour in the grate.

We appreciate the comments and suggestions of Mr. Hales, based as they are on experimental work, but still think that while a " simple test " may tell whether a fuel burns easily or not, it will not enable one to decide why and where one fuel differs from another—an important point in comparing products of differing origin and mode of manufacture.

The ideal procedure would have been to take given coals, as suggested by Mr. Lymn, subject them to different methods of carbonization, and examine the products. Actually this was impossible. The tests had to be made on such samples as became available—particularly peculiar samples. We have pointed out that the nature of the raw material—*i.e.*, the rank of the coal—though having an influence, is only one factor. We have therefore preferred to correlate the behaviour of the fuel with the actual measurable properties of the coke as received, whatever its origin or previous history. Thus sample No. 12 was made from a high rank Durham coal—it was actually the coke made in the Croydon tests reported in the 32nd Report of the Joint Research Committee—but it proved to have an unexpectedly high chemical reactivity both to CO_2 and oxygen. Nevertheless it was the most difficult of all the cokes reported to ignite in the test grates. On the other hand, the cinders left after burning a Yorkshire house coal, although almost identical in chemical reactivity, were as easily ignited as a low-temperature coke. The main difference was in the density, 30 lbs. for the sample No. 13 and 20 lbs. per c.ft. for the cinders.

It is recognized that blended cokes have not received the prominence they deserve, but few commercially available samples have come our way.

Mr. Gill points out that the figures relating to sample No. 13 are incomplete. These figures are quoted from a test made long ago but by a method not identical with that now described, and only some comparable figures have been given.

We are grateful for Mr. Clayton's description of the sample No. 19, which has the properties of a rather reactive vertical retort coke and is a remarkable product considering its mode of manufacture. No. 18 more nearly resembles a horizontal retort gas coke than a typical high class metallurgical coke. No. 20 is, of course, a low-temperature product. These three samples are not included as representative oven cokes, but they show the range of products obtainable in full-sized ovens.

Some samples were proprietary products and their names could hardly be included.

We agree with Mr. Carmichael that the density of intermittent vertical chamber coke is probably due to the weight of the charge, and in this respect it resembles a coke oven coke. Sample No. 12 was more reactive chemically than a

metallurgical coke, and it ought to be a good fuel for closed stoves.

Gas Used for Ignition.

Several criticisms refer to the quantity of gas used for ignition but we were not concerned with determining the minimum requirement. The criticism will bear particularly on the figures given in Table II. on the vertical faced grate. Now just as in this grate the fuel is more efficiently used, so also it is more difficult to ignite owing to a greater loss by radiation. The differences in ignitability are exaggerated, which is advantageous in the comparative testing of fuels. Indeed it has at times been found almost impossible to ignite some fuels in this grate. This was in mind when writing the sentence on p. 39, quoted by Mr. Mott, who has pointed out a disharmony between Parts 1 and 2. Actually the oven coke No. 18 has shown considerable variation in character. The tests reported in Part 1 and Part 2 were made several months apart on different consignments. The figures given in Table IV. for coke No. 18 refer to the material used for the test reported in Table VIII. It will be seen that it was both lighter and more reactive than the coke employed in Test 18V (Table II.), resembling in character a vertical retort coke, and it is not surprising that it was similarly responsive to treatment with a skin of coal.

Answers to questions as to grate construction and test routine will be found in Sections VI. and VII. The calorific value of the gas used for lighting was 470 B.Th.U. per c.ft.

We agree with Mr. Carr as to the importance of size of fuel and the spacing of the grate bars, particularly when dealing with the more difficult fuels. Those which have found a ready sale hitherto offer no difficulty when graded within the limits used—1 in.-2 in. Although the influence of spacing the bars has not been systematically studied, it was shown that the rate of combustion could thus be altered. Two low-temperature cokes, Nos. 14 and 16, were re-tested with grate bars more closely spaced. Although these tests were not reported in full, the values for the product P are given in Table V., under the number 14A and 16A, and the corresponding outputs of radiation are plotted against P in fig. 5. Apart from the fact that these results support the view that the output of heat varies with the product P, they also show the spacing of the bars influences the rate of combustion and therefore the behaviour of the fuel. It deserves systematic study so that grates and fuels could be matched.

Mr. Toogood's comments are interesting and suggestive, but in these experiments no measurements of the flue loss were made. Previous experience had shown the difficulty of these measurements with flue gases containing a very small and variable content of carbon dioxide.

Silent Burning Cokes.

We consider that Mr. Firth's observation that speed of quenching determines noisy burning most important, and although we have made no deliberate tests, our experience is in harmony. This observation is a point in favour of dry cooling. There may be other causes, for the petroleum coke did not burn silently. Volatile matter does conduce to ignitability, but it is an expensive agent for the purpose. Low density is also helpful and may compensate for the absence of volatile matter as exemplified by the coke sponge, which, though chemically inert, was the most ignitable of all samples tested. The cinders from coal, so far as we have examined them, might be described as a rather reactive high-temperature coke of very low density, and the higher the density of a coke, the more will its properties recede from those of coal.

Mr. Firth asks whether the weight of cinder left is a measure of ignitability. It may be, but we think too much attention ought not to be paid thereto. We have observed that a fire of suitable coke will take three hours to die out, and at the end of that time the ignitable residue of cinders can soon be revived where a gas lighter is available. It is arguable that it is wasteful for a fuel to burn too long when it is no longer required.

We have suggested that the ignitability of cinders is due to their light and honeycombed structure. This imparts a low thermal conductivity, and also, as pointed out by Mr. Hales, a low thermal capacity. These matters are now under investigation.

It was interesting to learn from Dr. Foxwell that coke sponge is found in coke ovens. We do not know whether we have misunderstood him, but we do not agree that this material does not easily burn. The sample tested was chemically inert but actually burnt more rapidly than any other high-temperature coke. As regards the desulphurization of coke, the work of S. Pexton and J. W. Cobb (Institution Gas Research Fellowship Report, 1923) suggests that the prospects are remote, except for what can be effected by coal washing.

We are very interested to hear Mr. Holton's plan to activate his coke while at the base of vertical retorts, and look forward to hearing the result.

Although agreeing with Mr. Dufton in general, we cannot share his objection to the use of gas for lighting fires, even coal fires. Looking to the future, it seems reasonable to suppose that the consumer, if forced to use solid fuel with its obvious inconveniences, will adopt means of reducing to a minimum those inconveniences—*i.e.*, labour and uncertainty of lighting and tending and chimney sweeping. If the use of smokeless fuel, ignited by gas, has not yet made great advances, there then exists an ample field for instructed salesmanship. To the objection that the public will not go to the expense of new fittings, it may be pointed out that, but for the introduction of new models, the motor, wireless, and other industries could not exist as we know them. The purchaser must, however, be convinced—like Mr. Dufton—that the new model is worth the cost, again a task for the salesman. As regards the scores of thousands of houses now being built, the objection of cost has no force, for no gas engineer would regard a gas point as superfluous at the fireplace. To argue that one should not use gas for fire lighting is analogous to saying that a self-starter is superfluous because a motor car is fitted with a crank handle.

We were very interested to read Mr. Hales' comments on the connection between density and output of radiation, but our experience has led us to regard it as a factor. Bulk density, as stated in the Report, is dependent on both form and structure. The high-temperature cokes quoted by Mr. Hales may be irregular in form but are dense. Low-temperature cokes which have proved successful are, in our experience, always light fuels, whether due to form, or structure, or both.

We agree with Mr. Branson that the needs of closed stoves and open fires differ and call for different products. Our experience is that dense coke from intermittent vertical chambers does not respond to activation with a skin of coal.

CONTINENTAL NOTES

GAS BURNERS WHICH WILL NOT STRIKE BACK.

An investigation of the striking-back propensity of gas burners is described by H. Zollikofer and N. Räber in Monats—Bulletin des Schweiz. Vereins von Gas- und Wasserfachmännern, 1933, 13, 269-271 (Nov.).

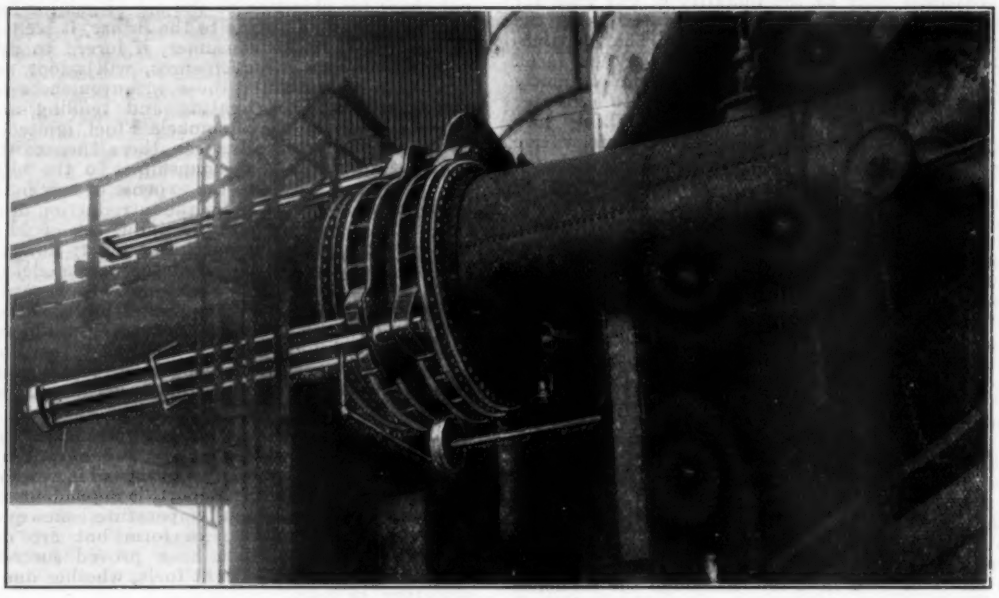
The object of the investigation was to design a burner which is absolutely incapable of striking back. If such a burner is ignited at the jet, the flame is carried forward to the burner head.

Experiments were carried out with burners consisting of a jet and a brass tube. It was found that, with a given size of jet, the striking back tendency increases with increasing diameter of the burner tube and with increasing distance between the jet and the inlet to the burner tube. With burners of small consumption—*e.g.*, that of a gas cooker burner with a consumption of about 16 c.ft. per hour—the length of the burner tube had no effect on the striking back tendency over the range investigated (tubes of 0·24, 0·28, 0·32, and 0·36 in. bore and 1·6 and 3·2 in. in length). With a larger burner having a consumption of 60 c.ft. per hour, it was found that a long tube gives better freedom from striking back than does a short tube over the range investigated (tubes of 0·36, 0·39, and 0·48 in. bore and 4·7 and 6·3 in. length).

It was found that there is likely to be a tendency to strike back if (1) the jet delivers into a cylindrical burner tube and (2) if the jet characteristics are such that a thin cylindrical stream of gas issues from it. Striking back may be eliminated if a correctly proportioned Venturi tube is inserted in the jet end of the burner tube and if, at the same time, a strip of metal bent into helical form is inserted in the jet. This ensures that a diffuse stream of gas issues from the jet. With such a burner, it is impossible to ignite the gas at the jet.

On the basis of the facts elucidated and with the help of the particulars covering Venturi tube design given in the handbook, "Combustion," published by the American Gas Association, it was possible to construct an anti-strike back burner having a gas consumption as great as 170 c.ft. per hour. The Venturi tube, in association with the device securing a diffuse stream of gas, ensures that perfect mixing of gas and primary air occurs. The Venturi tube must have a throat of diameter appropriate to the gas consumption of the burner and, beyond the throat, must widen out towards the burner head.

Thermal Expansion Goggle Valve



During a recent visit to the works of Messrs. Ashmore, Benson, Pease, & Co., Ltd., at Stockton-on-Tees, we saw in course of construction the McGee patent thermal expansion goggle valve, the sole licence for which the firm have acquired for the British Empire.

The thermal expansion goggle valve is operated by means of thermal expansion or contraction of metal tubes, thereby opening or closing flanges to free or clamp the goggle plate. Expansion tubes have been used for many purposes, but in this design for valves over 24 in. bore three tubes, equally spaced around the valve, produce a definite, positive, powerful force when steam or gas is admitted, the expansion of the tubes separating the valve flanges to allow easy swinging of the goggle plate. After the plate is swung, the heating element is turned off and the tubes allowed to cool normally, or more rapidly by the admission of cold water, when the contraction of the tubes moves the flanges together to clamp the plate and close the valve. It should be mentioned that for the smaller size of valve, say, under 24 in. bore, a modified design incorporating a single expansion tube is used.

The valve flanges are of powerful design, made of open-hearth steel thoroughly annealed, and the expansion elements are ruggedly built; so that when the tubes expand or contract, the valve must open or close uniformly around the seat of the valve.

With the flange castings and expansion element properly designed, of sufficient weight and strength, the resistless force resulting from admitting a flow of steam into the expansion tubes and changing to a flow of cold water assures positive uniform releasing and clamping of the goggle plate. An absolutely gas-tight valve is the result.

The flange movement is accomplished by the mere turning of a small valve to admit the steam or water (which valves may be conveniently located near the ground level), and then the opening and closing of the large goggle valve can be quickly done by a pull on the operating chain provided for swinging the plate. The operating chain is direct-connected to a worm gear unit, which is oil and dust-tight and is suspended directly underneath the goggle valve. This unit assures quick and easy swinging of the goggle plate and reduces the man power required to a minimum. In cases where it is not practicable or desirable to use steam as the heating medium in the expansion tubes, hot blast or hot gas or electrical heating elements may be substituted, and, as an alternative for cooling, compressed air may be used in place of water.

The flanges and pull rods can be designed to provide contact pressure on the goggle plate of 1000 lbs. per lineal inch, but in practice from 250 to 500 lbs. per lineal inch is found to be more than sufficient. The expansion tubes are of solid drawn extra heavy steel hydraulic tubing or Admiralty Bronze. The average time required to operate a 90-in. valve from ground level is less than four minutes from the turning on of steam to the final clamping of the plate after water admission to the tubes.

Among the orders which Ashmore, Benson, Pease, & Co., Ltd., have recently secured for this patent thermal expansion goggle valve is one for three of 120 in. bore, and we understand that these will be the largest ever constructed of this type. For such large valves the goggle plates are swung by an electrically driven unit.

Modern Furnace Equipment.

An illustrated technical brochure of much value has been published by the Incandescent Heat Company, Ltd., of Smethwick, and it will be of great interest to our readers. Many types of gas-heated furnace equipment are described, among them being a Scholes plate heating furnace, coke oven gas fired, suitable for plates 45 ft. by 9 ft., and loads up to 10 tons per charge. The furnace is provided with a roller bed only during charging and discharging operations, thus eliminating all difficulties and making it possible to withdraw the plates hot and without distortion.

Another interesting unit is a town gas furnace of the pusher type for bright annealing, suitable for temperatures up to 1000° C. The equipment includes sealed cooling chamber and quenching tank, an inert atmosphere being maintained throughout the furnace. Machines such as this, which may be operated by unskilled labour, provide for the automatic self-generation of a protective atmosphere inert in relation to the metals treated, and ensure accurate heat treatment combined with preservation of polished surfaces produced by drawing, pressing, rolling, or similar operations.

Then there is an Incandescent twin-chambered vertical muffle furnace for the critical treatment of high-speed steel, especially hack saw blades. Being operated by fan-blast burners, temperatures from 950° to 1400° C. are obtainable. The waste gases are utilized for pre-heating the stock before it is placed in the soaking chamber. A special feature of this furnace is the rapid manipulation of the doors by suitable link movement.

Finally may be mentioned a town gas fired, natural-draught, continuous conveyor furnace 20 ft. long, used for aircraft, special steels, and alloy tubes. Flexibility and accuracy of control characterize this plant.

Pneumatic Cleaning of Gas Coke

By C. W. H. HOLMES, M.Met.

It is only during the last decade that the consumer has insisted not only on well-screened coke from gas undertakings, but also upon products which contain the minimum of ash and moisture in the coke particles themselves, together with an absence of those pieces of incombustible material usually known as " bats." This is due mainly to three causes, the first being that the buyer has had during this period an almost unprecedented opportunity for enforcing his demands as regards quality upon a depressed market, and the second lies in the fact that not only gas coke, but fuel of all descriptions, is subjected to an increasingly rigid inspection by the purchaser. As regards the third cause (almost too painful a subject to be stressed in an article which is addressed mainly to the Gas Industry), this is the presence of a comparatively new competitor in the domestic coke market as a result of the cutting and screening of metallurgical coke into domestic sizes.

Patent oven coke nuts produced—as they almost invariably are in this country—from washed coal, provide a reasonably low ash product absolutely free from extraneous pieces of shale, or " bats."

Without wishing to labour the point, the writer would remind the manufacturer of gas coke that in order to market such a coke as described above, the producer of patent oven coke has not only to purchase, install, maintain, and operate a washery, but he must also face a loss in refuse and slurry of usually about 15% of his raw coal.

Now the Gas Industry, no longer in the rôle of vendor, but in that of one of the largest coal consuming industries, has been perhaps unduly optimistic in hoping that the coal industry would, of its own free will, install efficient coal-cleaning plant, and would face the operating cost and loss of vend without adequate recompense in the selling price of the coal. True, persistent complaints in a depressed market have had an appreciable effect in reducing the percentage of dirt in consignments of coal sent to gas-works, and the operation of the Coal Mines Act in transferring to a large extent the basis of competition from price to quality, has had a further tendency in this direction, but we are still a long way from the time when English gas coals will invariably be delivered in such a clean condition as to enable the gas engineer to carbonize them with the knowledge that the resultant coke will be free from visible impurities.

So long, however, as present conditions persist, the manufacturers of metallurgical coke will maintain a strong sales advantage by being able to market a product which is definitely free from extraneous incombustible matter, and although a domestic fire made of patent oven coke nuts may not be so readily ignited or maintained as one made of a good gas coke, yet the relative purity and the price of the former product render it a strong competitor against many gas cokes as they are marketed at present.

Conditions of Marketing Gas Coke.

Summarizing the conditions under which a gas coke free from pieces of inert material may be marketed, we have three possible methods to consider:

(*a*) The cleaning of the raw coal at the colliery.

(*b*) The cleaning of the coal at the gas-works before carbonizing.

(*c*) The cleaning of the coke after carbonization.

The first method has already been briefly considered, and is undoubtedly an ideal one. It is widely practised already, and might quickly become almost universal if its commercial aspects were more sympathetically viewed by the Gas Industry.

The practice outlined under heading (*b*) is, so far as the writer's knowledge goes, confined to one single instance in the British Isles. Its drawbacks lie in the fact that not only has freight to be paid on the refuse at clean coal rates from the pit to the gas-works, but after this the refuse has to be removed, and the cost of its disposal must be faced—and this is usually a serious matter to gas-works situated more or less in the centre of a town.

It is difficult to make out a general case in favour of cleaning coal at gas-works. In the first place, it means presenting the railway companies with a little over ¼d. in freight per ton of coal for each 1% of dirt carried over an average haul, so that in cleaning a coal containing 10% of dirt at its destination instead of at the colliery approximately 6d. per ton has to be paid in freight on worthless material—a sum that might to advantage be shared by producer and consumer were the coal cleaned at its source.

In the second place, it must be remembered that the shale and " brasses " removed from coal during cleaning cannot be disposed of so readily as can normal gas-works ashes and clinker, because this refuse product has no uses, while it is also liable to take fire if allowed to accumulate on site.

Prior to the introduction of minimum prices under the Coal Mines Act, many collieries were prepared to accept very low prices for their low-grade coals rather than face the cost of, say, 2s. involved in putting them on the ground and loading them up again, or, alternatively, of facing demurrage charges if the coal were standing in wagons. Then a better case could be made for cleaning coal at the gas-works, whereas now it can only be in a few special cases that any commercial advantage could be derived.

We now come to the final alternative, taking the coal as it comes, carbonizing the refuse along with the coal, and extracting the pieces of incombustible shale, or " bats," from the coke, and here, the writer regrets that this article was not preceded by another, dealing with the distribution of incombustible matter in gas coals and its influence on the resultant coke. Had this been written previously much of the matter following could have been omitted.

Removal of Incombustible Material.

Generally, few (if any) pieces of incombustible material large enough to be retained on, say, a 2-in. screen find their way to gas-works. Pieces of dirt of this size are readily seen and removed by hand-picking at the colliery, and while pieces of inert material from 2 in. down to fine dust will be found in all coal that has not been mechanically cleaned, or, alternatively, has been badly cleaned, we are mainly concerned for present purposes with the removal of those pieces of incombustible matter which are too small to be economically removed by hand-picking, and which range in size between about 2 in. and, say, ¼ in. That is to say, we are now dealing with the " bats " that find their way into the screened domestic or industrial sizes of gas cokes.

These pieces of inert material do indeed find their way into the above sizes with remarkable facility, first, because they are generally flattish in shape and provide planes of weakness along which the coke splits when quenched, and, secondly, because they have a tendency to absorb the caking constituents of the coal during the plastic stage in the retorts and to weaken still further the bond between coke and " bats," so that the latter separate all the more readily on quenching.

When unscreened coal—that is to say, hand-picked large coal re-mixed with cleaned or uncleaned smalls—is purchased, it must, of course, be crushed before carbonizing; and anyone who cares to try the experiment will find that there exists a strong tendency for the coal to be crushed to a much greater extent than the dirt, with the result that, although a portion at least of the large coal may be reduced to powder, the shale particles tend to retain their original size.

Again, if the large coke (say, over 2-in. screen) be broken down carefully, it will rarely be found to contain any sizable pieces of incombustible matter, for the reasons stated above.

Summarizing, if the coke is not cut—that is to say, if it is screened as discharged from the retorts—the need for mechanically cleaning the large coke would not arise (even were mechanical cleaning practicable with such large material). The bulk of the " bats " are concentrated, therefore, in the screened sizes, " nuts," " beans," &c., and while the fine breeze, or dust, may or may not contain a high percentage of incombustible particles, it will only rarely warrant the cost of cleaning.

It will be apparent, therefore, that the removal of the incombustible particles after carbonization offers several possible advantages. As we have already seen, circumstances tend to concentrate these impurities, so that only a portion of the coke need be cleaned. Secondly, the ability to remove the incombustible matter from the coke places a wider coal market at the disposal of the gas-works, and, finally, it is worth remembering that coke is rather more easily cleaned than coal.

Separation of " Bats."

Turning now to the methods available for the separation of the " bats " from the coke, we find that all those which

have been successfully applied in the past have depended on the difference in density between the coke and the incombustible matter; but just as in the cleaning of coal one rarely finds a sharp line of demarkation between a pure, low-density fuel on the one hand and a heavy incombustible product on the other, there is nearly always present a small percentage of particles of doubtful material —that is to say, pieces of very dense coke, pieces of carbonized "middlings," which have not swollen sufficiently to lose their original shape, and thin flakes of incombustible material with coke adhering to them.

As a matter of fact, in a gas-works where "washed nuts" exclusively are carbonized, the resulting coke should contain nothing worse than these doubtful particles, as the whole of the shale, or "bat"-forming refuse, should have been removed from the coal during washing. In practice, these half-and-half particles must go one way or the other. If they are discharged with the coke they increase its quantity, but also its ash content, while if they are discarded with the "bats" a small percentage of combustible material will be lost. They cannot be completely separated into either of the final products, but they are mentioned here because when found in the coke they create the impression that they should have been discarded, while if they are found among the "bats" they make the process appear wasteful. Actually in normal coke cleaning practice they are not worth worrying about.

Table 1 gives the approximate densities of the various materials involved in the cleaning of gas coke. The figures refer to the apparent densities of the dry cokes, but, so far as the impurities are concerned, surface moisture makes no appreciable difference to their densities.

TABLE I.

Material.	Density.
Porous coke	0·75–0·80
Normal coke	0·80–0·90
Dense coke	0·90–1·25
"Bats"	1·25–2·50

Until recently the only method available for removing the heavy incombustible impurities from coke was by wet washing, and, although various processes have been employed from time to time, probably the most successful, and certainly the most widely used plant in this country, is the barrel type of washer. This type of coke-cleaning plant has been described time and again, and is so familiar to all those who are interested in the production and preparation of gas coke that its description here is unnecessary. Its wide application confirms its successful performance in practice. In other words, it is capable of separating "bats" from coke when treating a closely-sized feed at low capacities. Heavy construction, simplicity of design and operation, together with the ability to handle a fluctuating feed of varying dirt content, are among its main advantages.

Disadvantage of Wet Washing.

In common with all processes for washing coke, however, it operates under the disadvantage that it wets the coke, and the percentage of added moisture may well be considerably greater than the percentage of "bats" removed when washing. This is especially so when the coke is washed before it is cold, as then the contact with the cold washing water causes the gases in the pores of the coke to contract, with the result that the water is drawn in, and the washed coke has a high moisture content which cannot be substantially reduced without resorting to thermal drying.

Although it may seem almost incredible, experiments have shown that it is possible to fill 80% of the pore space in fairly dense coke nuts with water by this means. This added moisture in the coke is not only a distinct disadvantage from a sales point of view, but it must also be remembered that it increases the density of the coke, and renders its separation from the "bats" more difficult.

Natural drainage does little to reduce the moisture content of washed coke nuts, but, given dry weather, some reduction may be obtained by storing the coke in shallow heaps.

The complete removal of the moisture by passing the washed coke through thermal dryers has been suggested, but, so far as the writer's knowledge goes, this has not yet been adopted. In any case, with an abrasive product such as coke, thermal drying has not a great deal to recommend it, even assuming that the dryers were fired with coke recovered from pan ash or similar low-grade material.

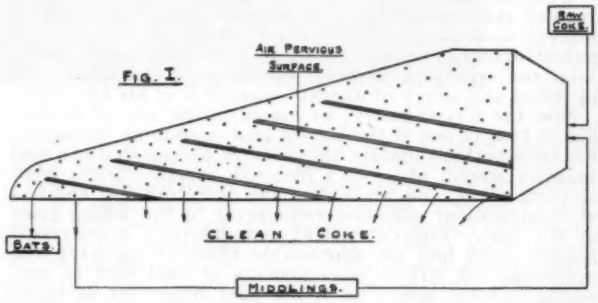
The second alternative now available for the removal of the incombustible particles is the pneumatic process in which the coke is floated by means of air instead of in water. Coal has been treated by this process (which originated in the United States of America) for about 15 years, and since its introduction into this country some ten years ago by the Birtley Company, a number of plants have been installed at collieries for the cleaning of gas coals.

Gas coke was successfully cleaned experimentally on a commercial scale by the pneumatic process several years ago, but it was not until 1932 that the first commercial plant for the dry cleaning of coke nuts was put into operation. This plant was installed at the Southall Works of the Gas Light and Coke Company to treat 20 tons per hour of coke nuts 1½ in. to ⅜ in. in size. It has apparently proved so satisfactory in operation that three further plants are now under construction for the Gas Light and Coke Company's Fulham, Brentford, and Bow Common Works.

The Pneumatic Process.

The pneumatic process is perhaps not so well known in the Gas Industry as is the wet process, and a short description may be of interest.

Briefly, the raw coke is fed either by gravity or by a mechanical feeder on to the surface of the separator, which consists of a more or less triangular perforated metal sheet (the general shape of which is shown in fig. 1). This forms the upper surface of an air chest, which is reciprocated on inclined toggle plates at high speed in the direction of its length. Air is supplied to the under surface of the perforated metal plate by means of a centrifugal fan which maintains a pressure of about 3 in. W.G. beneath it.



Under the combined influence of the jigging motion of the separator and the air pressure, the "bats" sink through the more or less fluid bed of coke particles on to the perforated surface, where they are trapped behind steel strips, or riffles, and gradually jig along to the extreme end of the separator, whence they are discharged into their respective hoppers.

It is usual, in practice, to take off the dense coke and doubtful material of intermediate density which is discharged next to the "bats," and to return this to the raw coke for re-circulation. By this means a sharp separation between cleaned coke and "bats" is obtained, and material of intermediate density is given every chance of discharging into the desired product. Alternatively, it can be taken out as a separate product.

The air passing through the coke bed invariably picks up more or less coke dust, and in order to eliminate any nuisance as a result of this dust being blown about, the air is passed through a filter before being discharged to the atmosphere.

The type of filter used consists essentially of a cyclone in which any coarse and gritty dust is deposited, and which is surmounted by a bag filter whereby the very finest dust particles are collected and pure air is discharged to atmosphere. In cases where dust-collecting plant is already installed the separator may be linked-up to the existing equipment.

Working Results.

In order to give some indication as to what can be effected by this process some actual results are given below, and the analyses of various products are considered in the light of the information previously given regarding the distribution of incombustible matter in the untreated and treated coke. It should be noted that all ash contents are given on the "dry basis" unless otherwise stated.

Coke nuts resulting from the carbonization of unscreened Durham gas coke showed an ash content of 12·4%. After treatment on a pneumatic separator the remaining products gave the following ash contents: Cleaned coke, 8·3%; refuse, 68·5°.

An ash content of 8·3% in the cleaned coke does not at first sight look attractive, but the treated product was free from any visible incombustible impurity, and was, therefore, as good as could be expected. Actually, this ash content of 8·3% is made up of a total ash content from the coal before carbonization of, say, 6%, which, in turn,

is made up of, say, 3·5% of ash, due to that inherent in the coal structure, and 2·5%, due to the very small particles of shale in the raw coal.

These very small pieces of incombustible matter do not present sufficiently large surfaces to cause fractures in the coke, and are, to a large extent, left in the large coke, or in the nut sizes, rather like currants in a bun. This fact can be demonstrated by burning a single gas coke nut slowly in a muffle furnace. When the coke is completely burnt away the resulting ash will be seen to consist of two portions, one being in the form of an impalpable powder, resulting from the inherent, or "fixed" ash in the coal from which the coke was made, and the other consisting of small, coherent particles which are the residues from the shale particles in the raw coal.

These latter particles are usually very friable, but the two varieties of ash can be readily separated by careful screening on a 10 or 20 mesh hand-sieve.

Generally speaking, a high percentage of "bats" in the "nuts" sizes is an indication that the ash content in the cleaned coke will be high, due to the presence of an equally high (or even higher) percentage of very tiny pieces of incombustible matter cemented into the coke substance. The results given in Table II. were obtained from a test on a few tons of very dirty coke "beans," and serve to illustrate the point raised above—namely, that a high percentage of free incombustible material in the domestic sizes is almost invariably accompanied by a high ash content in the cleaned coke.

TABLE II.

Product.	% Weight.	% Ash.
Raw coke	100	24·6
Clean coke	84	12·7
Refuse	16	75·8

There is, of course, no suggestion that the whole of the minute pieces of incombustible remain cemented in the sizable coke; far from it. More or less of these particles are certain to break free from the coke, and, as is common knowledge, be found in the "dust," or "ballast." Indeed, when present in large quantities, these fine particles of shale exert quite an important effect on the formation of dust.

To illustrate this, along with several other points of interest, data relating to the pneumatic cleaning of coke breeze screened through 1½-in. mesh is given in Table III. The breeze was fed to a pneumatic separator without presizing—that is to say, 1½ in. to 0—and samples of the raw and cleaned coke were screened at ½ in., ¼ in., ⅛ in., and 1/16 in.

TABLE III.

Size.	% Ash in Raw Coke.	% Ash in Cleaned Coke.
1½ in.–½ in.	15·9	6·5
½ ,, –¼ ,, ...	18·0	6·9
¼ ,, –⅛ ,, ...	18·7	9·0
⅛ ,, –1/16 ,, ...	19·3	13·8
1/16 ,, –0 ,, ...	21·5	15·3

The analyses show a progressive increase in the ash content of the raw coke as the size of particle decreases, and attention is drawn to the ash contents of various sizes of the cleaned coke.

The removal of free pieces of incombustible material is complete in the sizes 1½ in. to ½ in. and ½ in. to ¼ in., but in the size ¼ in. to ⅛ in. the ash content of the cleaned product (9%) shows that although refuse equivalent to 18·7% *minus* 9·0% = 9·7% of ash has been removed by the cleaning process, yet a small proportion of dirt, probably equivalent to 2% of ash, has been left in the cleaned coke, as there is no apparent reason why, given perfect cleaning, the ash content of this size should not have been reduced to a similar figure obtained in the larger sizes.

Below ⅛ in. and above 1/16 in. the analyses show some ash reduction as the result of cleaning, but the removal of incombustible particles in these fine sizes is limited, first, by the fact that the range of sizes which can be successfully treated in one operation has been exceeded, and, secondly, by the high moisture content (12·2% in the raw material).

The coke in question was quite porous, and the "bats" quite as heavy, as the average, so that the data given in Table III. indicates under normal conditions about 6:1 as the limit of the size range that can be treated in one operation.

In cases where 2 in. to 0 or 1½ in. to 0 breeze is to be cleaned, and where screened sizes are not already made, pneumatic cleaning could usually be profitably applied on the lines indicated in fig. 2. This arrangement of plant provides a more economical construction where comparatively small tonnages of coke are available; it also has the advantage of sizing the coke as a final operation, and thus eliminating that small percentage of breakage which is inevitable whenever coke is handled. It is important, however, to maintain by means of a raw coke bunker a reasonably steady feed to the separator when cleaning unsized coke. This is not nearly so important when reasonably closely sized coke is to be treated, as in this case the separation of the "bats" is practically automatic and is almost independent of the thickness of the coke bed on the separator, but when unsized material is to be treated, good separation is dependent on the resistance which the bed of coke offers to the passage of the air through it, and a steady feed is necessary in order to maintain a uniform thickness of bed.

Indeed, in all cases, not so much on account of the possible loss in efficiency, but to save power and to minimize maintenance, it is preferable to shut down the plant as soon as the supply of raw coke fails, and to start up again when a reserve of raw material has accumulated.

The pneumatic process is not only capable of separating the heavy particles of incombustible matter from the coke, but can, with reasonably closely sized coke, effect a separation between light, porous coke and heavy coke of lower porosity.

This is not as yet being done in an industrial plant, but has been proved experimentally on a commercial scale, and, as a matter of fact, this separation always takes place, but so far the light coke which is discharged nearest the feed end, and the denser coke which discharges further along the separator, have been mixed together in the commercial products.

FIG II

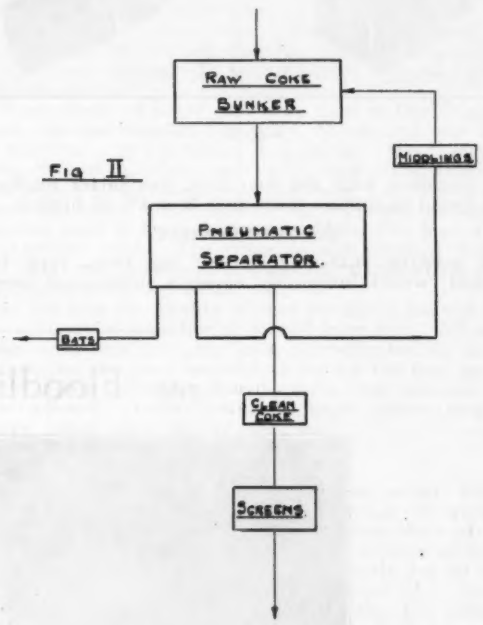


Fig. 3 shows typical examples of porous, normal, dense coke, and incombustible particles taken from a test on horizontal coke nuts.

Such variations in density are not generally so strongly marked in vertical coke, but the tendency always exists; and the results in Table IV. give some of the characteristics of a three-products separation carried out on coke from vertical retorts.

TABLE IV.

Product.	Apparent Density.	Porosity, %.	Ash, %.
Light coke . .	0·82	56	5·3
Dense coke . .	0·91	51	6·6
Refuse	1·76	26	73·3

(In passing, the low ash contents of the cleaned cokes should be noted as an indication of the results that can be obtained with coke made from low ash coal.)

Such separations may find industrial application in providing simultaneously a light, easily ignited domestic fuel, and a denser coke for industrial purposes.

The reduction in sulphur as a result of either washing or pneumatically cleaning gas coke is usually slight, and, indeed, no great reduction can be reasonably expected in view of the comparatively small amount of "bats" sepa-

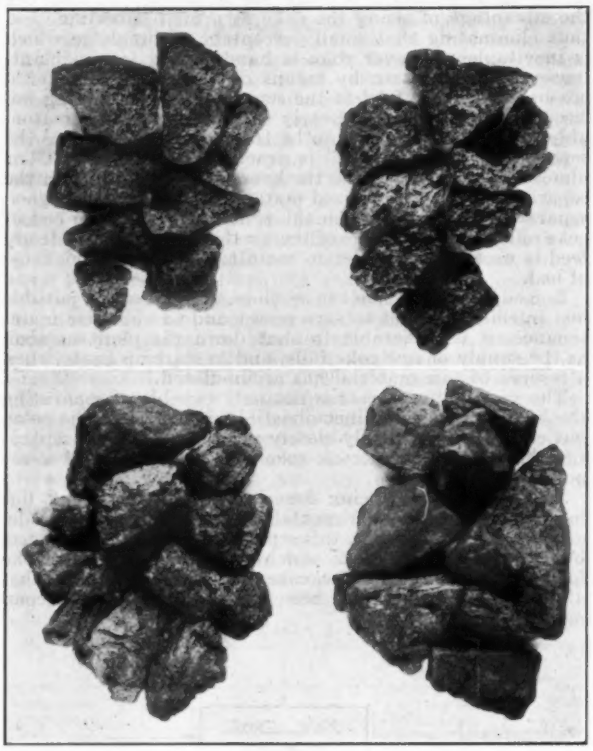


Fig. 3.

rated, together with the fact that this latter product is rarely found to contain more than 3 or 4% of sulphur.

Moisture Content.

Wet washing, unless the coke has been very badly quenched, would invariably cause a substantial increase in the moisture content of the washed coke, whereas pneumatic cleaning has the advantage of reducing this constituent, to some extent at least.

The decrease, however, in the moisture content of the coke after passing over a pneumatic separator will not, as a rule, amount to very much, and is a variable factor. In the first place, it depends on the temperature and humidity of the air used in the separation, and moisture reductions obtained during hot, dry weather would become negligible during a November fog. Further, the moisture reduction will also depend on the size of coke which is being cleaned, as the drying effect of the air can only operate at the surface of the coke, so that the smaller the pieces of coke the greater the surface exposed per unit weight, and the greater the drying effect that can be expected.

Some idea of the variation in moisture reduction with the size of coke can be obtained from Table V., which gives the moisture contents of three sizes of coke made from the same coal and quenched under similar conditions.

Table V.

Size of Coke.	% Moisture in Coke.	
	Before Cleaning.	After Cleaning.
2 in –1½ in. . . .	1·4	1·1
1½ ,, – ¾ ,, . . .	1·9	1·2
¾ ,, – ½ ,, . . .	6·2	3·4

The cokes were all cleaned on the same day, so that atmospheric conditions would be practically identical in each case. Before treatment, all three sizes of coke were bone dry to the hand, and had they not been so carefully quenched it is probable that the moisture reductions might have been rather more marked. It will be seen, however, that in view of the several variables which affect this aspect of the pneumatic cleaning of coke, together with the fact that the coke is only in contact with the air stream for a matter of seconds, no definite moisture reduction can be counted on. It can be said, however, that there is definitely no prospect of an increase in moisture as the result of pneumatic cleaning.

As a process pneumatic cleaning seems to provide the means for preparing gas cokes with lower ash and moisture contents, and with a higher percentage of fixed carbon, than has hitherto been possible.

Gas Floodlighting at Kendal

Our photograph is of Kendal Parish Church floodlighted by gas. The Kendal Corporation Gas and Water Department agreed that their Engineer and Manager, Mr. Thos. Crowdy, should floodlight the church for a period of five weeks, the lighting hours being from 5 p.m. to 9 p.m. daily. Floodlighting was commenced to celebrate the 800th anniversary of the Carlisle Diocese, and will end on New Year's Eve, when the time of lighting will be extended until after midnight. The lighting units were supplied by Messrs. Wm. Sugg & Co., Ltd., and consist of ten 10-light lamps, each giving 1000 c.p. The lighting has created great interest in the district.

The Manufacture of Household Coke in Coke Ovens*

By H. O. H. Cerckel.

When mentioning "household coke," low-temperature coke is naturally brought to mind, and a short reference to this is interesting. Some 2000 patents have been taken out, 450 processes tried, and over £12,000,000 has been spent—most of it in this country—yet the progress made is negligible, seeing that the figures of coal treated in England, being about 22,000 tons per annum only, are about the same as for the past three years.

The domestic coal market is a very big one, 40 million tons per annum being the accepted figure. Some industries, particularly in large towns, could use a good semi-coke instead of large coal. Gas-works coke output is not growing much, more being used for the manufacture of water gas, more gas is produced per ton of coal (by steaming, &c.), and many large towns buy cheap coke oven gas. Blast furnace coke requirements have decreased and from 15 million tons the figure is now down to about 9 million tons of coke made per annum at coke ovens. The practice of building coke ovens at steel and iron works is growing, and many coking plants built at collieries have to find another market. The increasing use of coal cutters has resulted in a larger proportion of small having to be disposed of, and the making of household coke is undoubtedly the best outlet.

Coke for Use in Open Grates.

No coke oven plant has been built in this country to produce fuel suitable for use in open grates. Having been a regular user of furnace coke at home, I am well aware that it is possible to use it, but to do so in a really satisfactory manner, special enclosed stoves have to be used. Coke suitable for use in open grates must be:

(1) Easily ignited; (2) as clean as possible (specially if a price equal to that of large coal is to be obtained), say, under 6% ash, to ensure also low sulphur content; (3) moisture as low as possible. There is little hope of displacing large coal containing 3-4% ash by coke if the latter has 10-12% of ash.

When using coke containing a high percentage of ash, it is found that after a time the ashes, which are evenly distributed, cover the pieces entirely and prevent the access of air. It is then necessary to resort to the poker. Coal, being stratified, does not show the same uniformity of ash distribution. One method used to counteract this is to have a thin but high depth of fuel; as the combustion is proceeding, the weight of the top layers press down and gradually move downwards, thereby loosening some of the ashes. It is found, however, that after a time the depth of the fuel is reduced to such an extent that the fire throws out little heat, and when fresh coke is added the long time taken in igniting it further reduces the heat emitted. When drawing a chart of these variations, the curve is much more uneven than those obtained when coal is used. To avoid these variations and keep the room at even heat, it is necessary to feed it too frequently to be practicable.

Although many fireplaces have been designed to assist the combustion of furnace or gas coke, the slow progress made in their adoption is a definite proof of their shortcomings. Enclosed stoves are not liked because the fire cannot be seen, and they do not produce sufficient ventilation. The obvious remedy is to make coke suitable for its use in open grates, instead of insisting on making high-temperature coke and trying to sell it for household purposes. It is important to remember that stocking two kinds of fuel is objectionable to most people.

One of the advantages of selling coke compared with large coal is that the bulk is greater. This appeals to housewives, who, after buying one hundredweight bag of coal, receive for the same weight one and one half bags of coke. It must be remembered also that when 4 to 6% of volatile matter is left in the coke it increases the weight of salable coke for a given quantity of coal treated, in that proportion.

Many colliery owners fear that the increased use of coke may be detrimental to the large coal market, but surely it is better for them to try to retain the use of the open fire by selling coke made by them, than seeing it replaced by gas fires and electric radiators, which, after all, are supplied by buyers of their small coal.

Blending.

In order to improve the coke, blending is resorted to. On the Continent this has always been practised of necessity, owing to the shortage of good coal, and the low value of small non-coking coals, which can be mixed, often with improved results. Although this practice has often been referred to, the extent of the intricacies in some cases is well illustrated by one of my own experiences. A Belgian coking plant, of which I had charge 30 years ago, was using coking coal (22% volatile matter), to which other coals (as low as 12% volatile matter) were added. The best coking mixture was found to contain 19% of volatile matter. The mixture was de-dusted, the fines (0 to ⅛ in.) not being washed. Three kinds of coke (according to ash contents) were produced: "washed" made from washed coal alone; "semi-washed," blend of washed coal and dust; "unwashed," blend of washed, more dust, and sometimes unwashed fines. A special coke breaking plant was in use. Altogether seven grades of coke were sold, and the weekly output was 1000 tons only.

Several references have been made lately to the Bruay coke works. The blend used there is semi-coke with the same coal untreated. As far back as 1860 French patents were taken for the mixing of coke breeze with coal to improve the coke and shorten the coking time. The research work of Roberts and Foxwell on this subject is well known. Much interesting work has been done by French engineers on such blends for coke production in the Sarre coalfield. Semi-coke has been used there successfully for many years in order to make coke from rich (38% volatile matter) coal. Without such addition the coke produced is very poor, being friable and fingery. The same process is in operation in Silesia. In both districts the coke is used in blast furnaces.

Wagonloads of Sarre coal were used in Derbyshire years back, by the Simplex Company, of which I was Manager at the time. It was tested in a special "flat" oven, 33 ft. long, 6 ft. 6 in. wide, and 15 in. high. The layer of coal was about 10 in. deep, and the oven was heated entirely from the sole. Some interesting coke was obtained, but the top part of the coke was spoilt by the heat stored in the arched roof. The drawing also created difficulties; the coke was, however, of good quality, without blending with semi-coke, but better with it.

In the past the quality of coke produced has not received the amount of attention it should have had. All efforts of coke oven builders have been concentrated on increasing the output per oven in order to reduce the first cost of the plant. The following alterations in that direction will be remembered: Ovens have been made higher, longer, narrower, taper, silica bricks used, &c.

Metal Retorts.

Most low-temperature processes use metal retorts or parts. These, of course, limit the range af temperature usable, and under the best of conditions their life is only a fraction of that of coke ovens made entirely of firebricks, some of which have worked continuously for 20 years at high temperature. The trouble experienced is due to the warping and growing of the metal, also the difficulty of making tight joints where metal meets firebrick work, the coefficients of expansion being so different. The costs of replacement and loss of output are an important financial consideration.

The Fuel Research Station has had considerable experience on this point, and their Technical Paper No. 35 sets out their findings and their reasons for replacing metal retorts by firebricks.

Fine crushing improves the texture of the coke, the smaller grains producing smaller and more even pores, which assists the combustibility. However, the finer crushing increases also very much the cost. It is advisable to use coal as dry as possible. Much heat is required to drive the moisture away; indeed, when dealing with coal of 12% moisture, almost as much gas is required to drive this away as to carbonize at medium temperature. Presence of moisture lengthens the coking period, the output being affected thereby. The quality of the coke is not so good with wet coal owing to the delay in the carbonization. Water vapours are better avoided in the bye-product plant also.

To carbonize coal in a suitable oven to 700° C. requires about half the heat needed for bringing the coke to the high temperatures reached in modern plants. On reaching 700° C. throughout the cake, two-thirds of the thermal yield of the gas recovered at high temperature is given off, or 75% of the volatile matter is driven off at that temperature.

When referring to medium temperature coking, fear of

* Paper read before the Midland Section of the Coke Oven Managers Association, Dec. 15, 1933.

difficulty of pushing is raised at once. It must be remembered that when coal reaches 350°-400° it is in a plastic state, and, obviously, trying to push coke out when such material is present is asking for trouble. It is necessary that the coke be at least 550° C. in its centre. It is a fact that hundreds of tons of good semi-coke have been produced in Yorkshire at two old plants under such conditions. Although the coke reached a maximum temperature of about 600° C. no difficulty has been experienced when pushing the coke out.

The greatest difficulty when trying to use coke ovens of normal design is due to the thickness of the sidewall bricks, which store much heat. Assuming an oven ready for pushing, the bricks have then reached their highest temperature. When a fresh charge is introduced, the heat stored in the face bricks is rapidly transmitted to a thin adjoining layer of coal. The bricks, having then fallen considerably in temperature, transmit heat at a much slower rate. These sudden alterations have their influence on the texture of coke adjoining the walls; breaks often occur, a thin layer sometimes even spalling off.

When heat transmission is proceeding normally, it must be at such a rate that the outer layers of coke do not get overheated. To obtain this in a normal coke oven 18 in. wide, the heat in the flues must be kept down to such temperature that the coking time is about 75 hours. It is realized at once that this would be quite uneconomical, the first cost of such ovens for a given output being about three times higher than that of high-temperature ovens.

Narrow Ovens.

To obtain economical results, it is necessary to resort to very narrow ovens, because coal is a very bad conductor of heat, also to avoid over-coking the layers adjoining the walls. Some experiments have shown that a layer of coal 28 in. thick, heated from one side, is coking at first at the rate of 1½ in. per hour, and the last inches at the speed of ¼ in. It took 72 hours to complete the coking at very high temperature.

At the Yorkshire coking plants already referred to the coking times were as follows: (1) 19 in. wide ovens take 70 hours to coke with a flue temperature of 750° C.; (2) 18 in. wide ovens take 80 hours with a flue temperature of 700° C. An oven 9 in. wide with 750° C. temperature in the flues would have a coking time of 12 hours and with 700° C. 13 hours. The time taken for coking in such narrow ovens is thereby one-sixth and the tonnage of coal dealt with, half. The narrow oven will produce at medium temperature coke much more even in texture throughout the charge. Assuming existing 18 in. ovens working at 1200° C. in the flues being replaced by 9 in. ovens working at medium temperature (750° C.), the output per oven day will be the same.

In France the narrowest ovens built are 7 in. wide, and the narrowest one built, full size, in this country was 10 in. wide. On this I made tests for size of coke produced at high temperature. Medium-temperature working was not then considered. One reason for which narrow ovens are almost a necessity at medium temperature is the fact that there is no fracture in the middle of the cake. The length of the pieces is therefore the width of the ovens, and handling such large pieces would offer some difficulty.

Medium Temperature Coking Plants.

Most progressive and practical work on the production of household fuel in coke ovens has been done in France. Mention will first be made of the carbonization of ovoids made of anthracite, which are carbonized in very narrow ovens, 7 in. wide, at Noeux and Besseges.

The location of anthracite in extreme districts only (West Wales and Scotland) reduces the interest in this proposition for us; further, the complication of having dry, clean coal, cost of pitch, and of pressing, extra handling, &c., add considerably to the cost of production.

Ovoids are little used in this country and their novelty would further add to the difficulty of selling them.

Bruay Plant.

Several references have been made to this plant lately. The Bruay mines have coal of 38-40% volatile matter, which at high temperature gives very inferior coke. For many years this company has carried out costly experiments with great tenacity and some satisfactory results. Their fuel, called "Carbolux," is intended primarily to replace anthracite in French stoves. Their tests have had for basis the mixing of some of their coal, after treatment at low temperature in rotary retorts, with some of the same coal untreated.

M. Pamart, Divisional Engineer at Bruay, gave some time ago many interesting details of their process, also of the plant at work. 480 tons of coal are dealt with daily. The coal must be dry, as wet coal would produce clogging with the coal dust present in the rotary retorts.

The design of the rotary retorts is covered by patents taken by the Bruay mines. Each set has two superposed rotary retorts made of ¾ in. mild steel plate, 33 ft. long, 3 ft. 3 in. diameter, placed on a slope. The top rotary retort is heated by the gases which have heated the lower one. Each set of rotary retorts deals with two tons of coal per hour, and five sets are required to produce the semi-coke needed. The top retort is composed of two concentric cylinders. The coal is introduced in the space between the two; having travelled its whole length, it is transferred to the inner cylinder, which is provided with blades. Travelling through this, the coal undergoes the oxidation process necessary to reduce its agglutinating power, air being drawn through by means of a fan.

The dust liberated by this handling would, of course, clog up passages and apparatus should there be any moisture present, and the oxidation process would not take place should the coal be wet. With coal containing 7-8% inherent moisture, as found in some local coals, difficulty may be found unless the feed is carefully regulated. The coal from the top middle retort reaches the bottom retort, which is also revolving. It is heated to an outside temperature of 650° C. (about 475° C. inside). The semi-coke produced is in pulverized form, as the bottom retorts contain steel balls. Their use is necessary to prevent coal caking to the sides.

The gases escaping from the bottom retort are collected; they have a calorific value of 800 B.Th.U. The semi-coke, after being cooled down, is crushed. The untreated coal is crushed by itself. They are stored in separate bunkers. The crushing necessary for producing a good fuel is very fine. The largest pieces are 1 mm., or $\frac{1}{25}$ in.; 50% is less than 0·2 mm.—that is, passes through a 75 mesh sieve. This is ten times finer crushing than is usual in coking practice. Crushed coal and semi-coke are mixed in a trommel to ensure thorough blending. The mixture is coked in 50 compound ovens, 14 in. wide. The temperature in the oven itself is 650°-700° C. maximum; the coking time 25 hours. The design of these ovens is fundamentally the same as that used for high temperature. The only claim of the oven builders is that they are evenly heated.

From the above it is seen that this process requires, in addition to an ordinary coking plant, a low-temperature treatment plant. Therefore this process is costly, much special machinery, power, supervision, &c., being required.

The Lecocq Coke Oven.

The only coke oven specially designed so far for medium temperature work is that of Lecocq. This Company has done much work on this subject and a short reference only can be made here. Different ovens have been built at a French colliery years ago; one, 16½ in. wide, heated up in the usual way, gave coke of poor quality. The next oven was 8 in. wide; this coke also was poor. After many other tests a firebrick oven, 16½ in. wide, was built, lined with metal plates, leaving a small space between the brick face and the metal, the idea being to heat the coal by radiated heat. The coke produced was very good. This full size oven, 8 in. wide, worked for a while, but so many difficulties were encountered by the warping and growing of the metal that it was given up.

The Lecocq Company, confident in the progress they had made, decided to build a similarly designed oven entirely of firebricks. The Lecocq Company's claim is to produce good household coke without resorting to the complication of pretreatment of some of the coal or blending with other coals. One full size oven has been working at the Montrambert collieries for over a year, dealing with the local poor coals available, to which 10-20% coke dust is added. The width is 9½ in. and the coking time 15 hours. The satisfactory results given have decided the building of a battery, now working, and some ovens are going up at the New Brancepeth Colliery Company, Durham.

The patent heating arrangement is quite new, the principle being the heating by radiation and conduction. The wall is divided into three parallel sets of flues, the central one in which the combustion takes place, and the two narrow outside ones adjoining the coke. The face bricks are panelled, being thin in the middle, in order to assist the transmission of heat. The header bricks conduct heat to the face also. The walls are strong, owing to their width, being 50% wider than normal oven walls. Communications between the centre flues and the side flues establish a circulation of products of combustion in the latter; this enables high temperature to be reached if desired. Existing ovens can be altered to this method of heating by re-building the existing walls. The width taken from the oven is transferred to the side-wall width.

In view of the low price of blast furnace coke and the

number of idle ovens and plants, this is of great interest. The coal need not be crushed finer than in usual coking practice. Coke dust and some non-coking coal can be mixed with coking coal. The coke produced in these ovens contains 4-6% volatile matter, is easily ignited, and will burn in open grates, making a pleasant fire. The temperature of the oven is kept at about 700° C. The proportion of dust and breeze is small. The coke is quite hard and will stand the usual handling without breakage. These ovens can be worked at high temperature also, to produce coke for furnaces, boilers, &c.

Bye-Products of Medium-Temperature Carbonization.

Although the coke should be the main paying product, the bye-products have great possibilities. (*a*) Ammonia: Very little is produced, but this is no detriment in view of the unremunerative price of sulphate. (*b*) Tar is light; it contains about 30% of pitch (half the quantity in normal coke oven tar), naphthalene and anthracene are not present, and there is no free carbon. There is a large proportion of phenols. Water is easily settled out by keeping the tar warm. The yield and composition vary with the temperature at which the ovens are working. The following figures of yield, recently published, are a good average. A working temperature of 600° C. yields 9%, 700° C. yields 8%, and 900° C. yields 5%.

M. Pamart, of Bruay, has published the figures of the various products made per annum in their plant. They are as follows:

"Carbolux"	130,000 tons
Spare gas for sale	315,000,000 c ft.
Road tar	11,000 tons
Motor petrol	340,000 galls.
Light oil, solvent	80,000 galls.
Carbolic acid	124 tons
Ortho cresol	146 tons
Metapara cresol	292 tons
Xylenols, etc.	146 tons

The method of treatment of this light tar is similar to that of other petroleum oil. Interesting information on light tar is found in the Fuel Research Technical Paper No. 34. The composition of medium temperature tar can be altered by affecting some cracking in the upper part of the oven, should this be desired. One can say that nearly twice as much tar is produced with medium temperature as with high temperature. Although small quantities only have been available so far, it is safe to assume that, containing, as it does, valuable products, its market value, which is now that of high-temperature tar, will exceed it when experience will have been added to the distillers' knowledge. It is a well-known fact that this light tar is the best raw material available for hydrogenation, over 75% being converted in motor spirit. The quantity of motor spirit recovered from both gas and tar is about double that obtained from high-temperature working. The motor spirit produced has higher anti-knock properties In view of the increased price of motor petrol it adds much value to the economic side of the process.

The gas is scrubbed for light oils in the usual way.

Use of Rich Gas for Motor Fuel.

A great future is in store for the rich gas produced—750 B.Th.U. During the war, gas was used in large quantities for driving motor vehicles, there being no difficulty in doing so. The cost for compressed gas is about half that of petrol per mile. The enormous progress made in the manufacture of cylinders of special steels, specially by the Chesterfield Tube Company, has enabled gas to be compressed and carried in very small vessels on motor cars and 'buses. The possibility of using gas 50% richer than usual is a big asset to the development of this problem. One can well visualize corporations owning gas-works, and public vehicles using their own gas, instead of imported petrol, in the near future. It is to be hoped that the sale of "bottled" gas will not be hampered by legislation, like that of "piped" gas.

Economic Views.

The costs of production by the processes mentioned cannot be gone into in detail, little information having been made public. In the case of the Lecocq oven, the labour costs per ton are about the same as high-temperature ovens. In the Bruay process, the pretreatment of coal requires close supervision; the power required for driving the various rotary retorts, fans, extra crushing, mixing, elevating, &c., is an important item also. Extra gas is required for heating the rotary retorts. The first cost of these two types of plant has been mentioned in a lecture by M. Berthelot, who gives the figures for complete plants per ton: Year of semi-coke for the Lecocq plant, 13s., and 50s. to 60s. for the Bruay plant. For ovens intended to work at medium temperature only, the machinery, doors, buckstays, &c., cost about two-thirds of those required for high-temperature work. Foundations, flues, &c., are smaller, reducing the cost further still.

The smaller volume of gas, for a given output of coke, reduces also the cost of the bye-product recovery plant, the ammonia recovery plant being limited to a scrubber for eliminating the risks of contamination in the benzole and tar plant.

Conclusion.

The advent of the use of coke ovens for open-grate coke production is new, and I have tried to present the most reliable information available on the subject. The figures mentioned are average ones, as with each kind of coal, type of plant, working temperature, &c., variations are introduced. Collieries should be the home for this new industry. Smokeless fuel will eventually be brought into more general use, and unless they produce this suitable fuel, they will lose many of their customers for large coal. There is also a good opening for this fuel for export, as a fuel which will burn in open grates will burn satisfactorily in any other appliance.

Legal Intelligence

Tenants and Free Choice of Light, Heat, and Power.

Gas Light and Coke Company Apply for an Injunction.

In the Chancery Division on Dec. 12, Mr. Justice Luxmoore heard a motion by the Gas Light and Coke Company, for an injunction to restrain the Corporation of Heston and Isleworth from (1) making or imposing any term in connection with the leasing or letting of any building belonging to them and being within the limits in which the plaintiff Company were authorized to supply gas, and for making or imposing any term, condition, or restriction with respect to the use or supply of gas in any such building, or the taking from the defendants of electricity or any form of heat, light, power, or energy; or (2) giving any preference or priority to any person on his agreeing to take a supply of electricity; or (3) subjecting to disadvantage any person not agreeing to take a supply of electricity; or (4) otherwise from infringing the provisions of section 4 of the Gas Light and Coke Company's Act of 1933. That Act, it was stated, prevented a local authority from making an improper use of its powers so as to compel tenants to take a supply of electricity.

Mr. Gavin Simonds, K.C., for the Gas Light and Coke Company, said he understood that Mr. Waite, appearing for the defendant Corporation, was prepared to submit to an injunction in the terms of the notice of motion.

Mr. Waite stated that he was prepared to treat the motion as the trial of the action and submit to an injunction in the terms which outlined the relief asked for.

Mr. Simonds remarked that he wished to amend his writ to ask for a declaration that the condition contained in the electricity supply agreement made by the defendant Corporation with their tenants, whereby the latter agreed to pay a standing or fixed charge for their electricity whether the same was in fact taken or not, was a condition made or imposed in contravention of section 4 of the Act. Mr. Simonds added that that condition, in his submission, was a most vicious form of an indirect attempt to contravene the section and its provisions.

Mr. Justice Luxmore gave plaintiff Company leave to amend the writ, the defendant Corporation giving an undertaking in general form pending the further hearing of the motion to-day.

Parliamentary Intelligence.

[From Our Special Correspondents.]

House of Commons.

It is announced on the Papers of the House of Commons that Gas Special Orders have had plans, &c., deposited in accordance with the Gas Undertakings Acts, 1920 to 1932, in respect of Accrington District Gas, Sittingbourne and Milton Urban District Gas, and Lea Bridge District Gas.

The following applications have been approved: Coatbridge Gas Company, Cheltenham and District Gas Company, and the Cirencester Gas Company, Ltd.

Heating Horizontal Retort Settings

[Discussion on Mr. H. J. Risby's Paper read before the London and Southern District Junior Gas Association, an extract from which was published in the "JOURNAL" last week.]

The PRESIDENT (Mr. H. C. Sims, South Metropolitan Gas Company) congratulated Mr. Risby on a most interesting and instructive paper, which must have involved a great deal of work and time. The history of the early practice of carbonization was very interesting, showing very clearly the development from the old cast-iron retort with direct firing to the modern siliceous and silica retorts with gaseous firing, and the utilization of the waste heat to heat the incoming producer gas and air. The introduction of the fireclay retort enabled higher heats to be used with a greater throughput and higher gaseous yield. In the horizontal setting as usually designed, as Mr. Risby pointed out, the distribution of heat was uneven, the retort on the combustion chamber side being very much hotter than on the sides remote from the chamber, and he certainly suggested an excellent method for remedying this. It had been advocated that the producer should be built well into the setting to minimize radiation losses from the front wall of the producer, but Mr. Sims thought that if the producer was built right under the setting unevenness of fuel bed would probably result with consequent short-circuiting of the primary air to the detriment of the producer gas and the walls of the producer. The embodiment of the "curtain arch" in the producer remedied this; they were built into producers at Vauxhall many years ago when Dr. Carpenter was Engineer, he being one of the first to use this principle, and he discussed its advantages very fully in a paper before the Gas Institution at that time. Mr. Sims asked, in regard to the limiting factors for refractory materials, if 1350° C. would not be regarded a safe temperature for siliceous retorts. Considering two settings of similar size, one with the tertiary air system and the other without, would it be necessary to use more producer gas in the one than in the other to maintain the same combustion chamber temperatures? With a temperature of 1350° C. in the combustion chamber which was again reproduced at the top of the setting what grade of firebrick was proposed for the cross-walls? He took it that the longitudinal and transverse baffle walls would have to be constructed of the same high-grade firebrick throughout. Mr. Sims considered the figure of 1·5 sq. ft. grate area per ton of coal carbonized per 24 hours for step grate producers rather on the low side; he would prefer about 2·5 sq. ft.

DAMAGE TO BRICKWORK?

Mr. F. O. HAWES (Tottenham), in a written contribution, inquired if the existing grate area was sufficient to supply the additional heat required for the tertiary air system, and if there was a tendency to damage the brickwork at the bottom of the flues of the tertiary combustion zone in cases where retort settings had been converted.

Mr. RISBY, in reply, said that the figures he had given as the limits of refractoriness were the recognized safety limits; in actual practice one usually worked a little nearer the limiting point, which, of course, necessitated closer supervision, though his figures were generally accepted as being safe work. In regard to the size of the producer, in introducing the tertiary air system of heating, as mentioned in the paper, 28·4% more heat was available for carbonization per gram of fuel in comparison with the generator setting; but, of course, since the system facilitated a 40% increased carbonizing throughput, actually the fuel to producers per setting would be more. Consequently, if one had an existing setting with ample grate area available, it would not be necessary to make any alteration in introducing the tertiary air system. Mr. Sims had suggested a figure of 2·5 sq. ft. per ton of coal carbonized for step grate producers. He (Mr. Risby) had stated his 1·5 sq. ft. figure as a minimum for step grates. Actually in practice a figure considerably lower than that was not unusual. With reference to the grade of firebrick desirable for cross-walls, &c., in tertiary air settings, at the points of tertiary combustion obviously the combustion intensity was comparatively negligible, since the percentage of gaseous fuel necessary at this stage to compensate a temperature drop of only 100° C. or thereabouts of the gaseous products was proportionately minute, and certainly not detrimental to the refractories at this point. As a precautionary measure against a remote possibility of flame impingement or "cutting" in the vicinity of tertiary combustion, he suggested the introduction of curved silica "splits" at the points indicated in the paper. There should be no tendency to damage the brickwork at the inlet to recuperators, the suggested temperature of 1250° C. at this point with siliceous material being well below the safety figure.

Mr. F. H. HIGTON (East Surrey) inquired if the velocity of gaseous products through the setting was increased or if it was necessary to increase the flue areas in the setting and recuperators, &c.

Mr. RISBY: Yes; I suggested in my paper that adequate allowance in the design of the tertiary air setting should be made for increased flue area and recuperator flue area to avoid the necessity for excessive main flue "pulls" and attendant undesirables, such as inefficient recuperation, &c.

CHEMICAL CONTROL.

Mr. HIGTON: I take it that to work the tertiary air setting efficiently one would require constant control, which might quite easily not be available on small works, many of which afforded no great concern to the control of horizontal settings. The value of the system might therefore be insufficient to warrant the additional expense of control. Would it be necessary to have definite chemical control?

Mr. RISBY said that although he would always advocate chemical control if available, it was not to be considered absolutely essential in the case of tertiary air settings, any more than in the case of ordinary settings, where control was effected by adjustment of slides and dampers in accordance with observations of main flue conditions—the "gassy" or "airy" atmosphere being indicated by presence or otherwise of the characteristic CO blue flame. The desired combustion chamber temperature being effected with the tell-tale blue flame at the main flue inlet "just lost," the tertiary air slides should be opened up and primary air increased until the blue flame again appeared in the main flue inlet. Then either the tertiary air supply, or, alternatively, the primary air supply, should be increased according to the temperature of the point of inlet of waste gases to recuperators. Once these adjustments were decided, any further temperature change desired in the setting could be effected by adjustment of the damper on the main flue inlet. Of course, it was desirable—but not absolutely essential—to have chemical control.

Mr. H. H. BROWN (Southampton) congratulated Mr. Risby on the excellence of his paper and asked him if he had considered the "vernier control" effect which the tertiary combustion stage facilitated with the small proportion of air for this complete combustion stage, which enabled one to work with only a slight variation in practice from the theoretical quantity of air required for complete combustion, and even an appreciable excess at this stage would have a very small influence on high CO_2 content of the final gases in the main waste gas flue.

Mr. RISBY replied that with the tertiary air system a 20% CO_2 figure could easily be maintained, since the tertiary air was, in effect, a "vernier control" as suggested, the volume of air for that complete combustion stage being so small a percentage of the whole air for combustion that a substantial excess should have no marked effect on the CO_2 content of the final waste gases. Also, since with the tertiary air system the volume of gaseous products was considerably greater than with the ordinary two-stage combustion setting, it was unnecessary to increase the volume of the gaseous products at the expense of combustion efficiency.

Mr. C. F. PETERSEN (East Grinstead) said that there would be, he supposed, a certain amount of final control necessary at the tertiary air stage which might be a drawback for small works, where practical observations were usual for the control of settings, which necessitated facilities for periodical inspection of the combustion chamber, &c. He suggested that inspection of the tertiary combustion zones would probably be a little difficult.

GAS DIFFUSIONAL CHAMBERS.

Mr. RISBY agreed that this was so. It was not very convenient to inspect the tertiary combustion zones, although he advocated gas diffusional chambers at these points, which would facilitate inspection. He suggested practical observations on the lines already advocated in reply to a previous speaker—*i.e.*, a desired central combustion chamber temperature and adjustment of tertiary and primary slides and main damper by observations at the inlet to main flue—in event of chemical control not being available.

Mr. F. J. HOPKINS (Gas Light and Coke) said he had had the opportunity of doing a certain amount of work upon settings somewhat similar to those described by Mr. Risby, and he could say that the matter of control was not so simple as had been suggested; they had considerable difficulty in obtaining even heating between the centres and ends of the retorts. He could not agree that the cost of silica settings was prohibitive in comparison with siliceous, as he had compared the relative costs recently and had found that the cost of the silica setting was slightly less than the siliceous. In regard to expansion—which was a subject they now knew rather more about—Mr. Hopkins thought that the Institution of Gas Engineers' limiting figure of 1% was fairly low. Mr. Risby had given the limit of refractoriness for siliceous material as 1300° C., but he referred to working the settings at 1350°. Mr. Hopkins presumed, therefore, that Mr. Risby agreed that siliceous material would work at 1350°

If 1300° was the limit of refractoriness for siliceous material, its working life at 1350° would not be very long. If the tertiary air system was to be introduced into an existing arch provision must be made for protecting the division walls between the settings, and he considered that a materially larger recuperator would be necessary; otherwise there would be difficulty in working under these conditions. In conclusion, Mr. Hopkins remarked that he had not yet experienced any reduction in fuel consumption.

Mr. RISBY said he had repeatedly stressed the point of desirability of adequate flue areas. Where the tertiary air was conveyed by vertical ducts in the main walls from the recuperators to the lateral collecting flues situated in the "spandrils," the main walls were protected by rebated silica tiles which "faced" the vertical uptakes, and again emphasized that the combustion intensity at this point, as previously indicated, was not pronounced. Again referring to the limits of refractories with the margin of safety indicated in the paper, he observed that the figures he had given were usually recognized safe temperatures for the types of refractories mentioned. Actually, one usually worked nearer the limit of refractoriness, and he maintained that, with reasonable supervision, 1350° C. was a reasonable working temperature for siliceous material, although 1300° had been given, with a margin of safety of 100° C.

The economy of fuel depended entirely on the recuperator efficiency, and he suggested that the tertiary air system was designed primarily to increase the carbonizing throughput of the setting, not as an economical proposition for the conservation of fuel. With efficient recuperation, however, the amount of fuel per ton of coal carbonized should be reduced, and he suggested that the settings with which Mr. Hopkins had experimented were not, at that time, constructed in accordance with the necessary flue area, grate area, or recuperator area that he (Mr. Risby) considered desirable, and the adverse comments on the system were therefore hardly justified. These defects had recently been remedied, and, no doubt, when the setting was put to work in the near future it would amply justify the claims. He was interested to learn that the cost of silica settings was less than siliceous, and suggested that the tertiary air system applied to all-silica settings would have the relative advantages of facilitating higher mean chamber temperatures with a consequent relatively increased throughput for the setting.

Work at the Fuel Research Station.

Mr. G. PERCIVAL (Fuel Research Station) said he would be interested to know the fuel consumption per ton of coal carbonized, and inquired if there was any more heat available in the waste gases that it was required to recuperate. He found that in many cases gas-works already had too much steam from waste-heat boilers. Mr. Risby had stated that the initial source of the trouble—*i.e.*, lack of uniformity of heat treatment of the total heating surface—had apparently been neglected. He (Mr. Percival) suggested that Mr. Risby should read the Fuel Research Board Report of a few years ago. With ordinary settings carbonizing 10 tons per day and burning the producer to give 18% CO_2 in the flue gases, the amount of flue gas passing was 25,000 c.ft. per hour, increasing to 87,000 c.ft. per hour without any alteration, and the differential pressures had been got rid of by increasing the pull. They had a setting at the Fuel Research Station, built some three years ago, with which they had persevered with the idea of putting all the flue gas into the producer with the primary air, and the actual calorific value of the gas leaving the producer was 40 B.Th.U., which would heat to 1350° C. in the combustion chamber. Under these conditions they could obtain a 50% increase and with steaming 82 therms per ton of 520 B.Th.U. gas. In conclusion, he observed that the possibilities of horizontal retorts had not yet been fully explored.

Mr. RISBY stated that he had not included the Fuel Research Station when he had made the remarks to which Mr. Percival had referred. He agreed that Mr. Percival's system had a great deal to commend it. He did not, however, agree that many works (having horizontal retorts) had sufficient steam from waste-heat boilers already, for waste-heat boilers could not supply all the requirements; if they had sufficient steam, then their recuperator systems must be working with a very low efficiency. It was true that some engineers are not too concerned about recuperator efficiency when waste-heat boilers were installed, and, indeed, the desirability of sacrificing recuperator efficiency—and consequently fuel economy—in order to justify the utilization of waste-heat boilers was a question of economics: but with the tertiary air system, one could justify the economies of waste-heat boiler installations with maximum recuperator efficiency with the advantages of considerably increasing carbonizing throughput and increasing the overall thermal efficiency of the carbonizing unit as a whole.

No Big Increase in Throughput.

Mr. J. A. NICHOLS (Gas Light and Coke) remarked that the temperature of the combustion chamber dropped 50° somewhere in the setting described; if this were taken into consideration the efficiency went up by 60%, because the average temperature would be 1150°, and this seemed a little too large. Mr. Nichols said that he was at the moment running a tertiary air setting, and they did not get this big increase in throughput. He did not think these temperatures were possible to obtain, nor did he consider it fair to make a comparison between the tertiary system and the regenerative system. If recuperation were applied to the tertiary setting a certain amount could also be applied to the secondary setting. He had obtained a figure of 1100°, while the same proportion of heat for the secondary air was 968°—giving a figure of 3442 gram calories, which amounted to an increase of 14 or 15% in the heat available for carbonization in the secondary air setting as against the tertiary setting. He would also point out that Mr. Percival was using ¾ cwt. of coke to drive his fans; further, fans were not suitable for driving gases through settings; they tended to be too inaccessible. He believed, however, that the circulation of the gases through the setting was the proper way to heat a setting, and that a setting could be designed which would give a fairly high percentage of circulation without the use of fans at all. He was trying such a setting at the present time, and it was possible to obtain a 25% increase in throughput quite easily. The tertiary air system was undoubtedly a step in the right direction.

Mr. RISBY, replying, said that Mr. Nichols had apparently had recent experience in experimenting with a setting which was not designed on the principle that Mr. Risby advocated, and therefore the disappointing results were perhaps not surprising. He was interested to learn that Mr. Nichols had evolved a system of heating retorts which embodied the feature advocated by the Fuel Research Station—*i.e.*, the circulation of flue gases. He was intrigued to learn that this could be effected without the use of fans.

Calculations Unsound?

Mr. W. R. BRANSON (Gas Light and Coke) said he would like to congratulate Mr. Risby on bringing before this Association a subject of such importance. The possibility of increasing the throughput of horizontal retort settings had exercised the minds of many of them for some time. He would, however, submit that the author's calculations were fundamentally unsound and that the economy in fuel consumption claimed could not be substantiated. This was indeed incompatible with the claim made for an increased waste-heat boiler evaporation as compared with the normal recuperative setting.

In his calculations, referring to the second stage of combustion in a generator setting, Mr. Risby referred to the air required per gram of combustible gases. This should, he thought, read "per gram of fuel burned in the producer." Then, under the heading of "Heat available for carbonization," Mr. Risby had deducted from the total potential heat of the fuel, less radiation losses, not only the heat loss in waste gases but also the heat required for raising the secondary air to the temperature of the producer gas. This was inadmissible, since the heat so used did not represent a loss of heat from the setting. The figures given for "Total heat available per gram of fuel" and "Total heat available for carbonization" should therefore read 7180 calories and 4125 calories respectively. That was approximately 57·5% available for carbonization instead of 43·5%

Under the heading "Possible saving of fuel," the author concluded that a saving in fuel of only 15·2% was obtainable by recuperation of 1428 × 0·85 = 1214 calories per gm. of fuel in a normal recuperative setting.

Consideration of a heat balance taken from Mr. Risby's figures and set out below, would show that the actual saving was 28%. Comparable figures were also set out for the tertiary air setting, again taking Mr. Risby's own figures, which showed an increased fuel consumption of 14% as compared with the normal recuperative setting:

—	Calories.		
	Generator Setting.	Recuperative Setting.	Tertiary Air Recuperative Setting.
Heat in coke supplied to setting .	7980	7980	7980
Radiation losses at 10%	798	798	798
Heat in waste gases at regenerator inlet	3055	3055	3990
Heat returned to secondary and tertiary air at 85% recuperative efficiency	..	1214	1573
Heat in waste gases leaving regenerator	3055	1841	2417
Heat used in carbonization (by difference)	4127	5341	4765
Calories supplied per calorie used in carbonization.	1·93	1·49	1·70

In calculating the increased throughput obtainable by raising the average temperature of the outside of the retort walls from 1180° C. to 1300° C., the author assumed the internal surface of retort to have the same temperature of 900° C. in each case. With the highest external temperature the inside face must also be hotter—though to a less extent. The increased throughput of 40% claimed would therefore appear high, though the calculation of heat transfer under carbonizing conditions was much too complicated to make any accurate estimate based solely on temperatures taken at a few points in the setting.

In putting forward a proposal for a tertiary air preheater on top of the setting, Mr. Risby claimed increased thermal insulation as an advantage of this arrangement. Since there was much more heat in the waste gases than could be taken up by the secondary air, there seemed no advantage in preheating the tertiary air by this means.

The calculation of the amount of producer gas required to be

burned at the top of the setting in order to obtain a 100° C. temperature rise in the heating gases also appeared to Mr. Branson to be unsound, since the amount obtained was only sufficient for a theoretical rise of 100°. To obtain an actual increase of this amount, a much greater proportion of the gas would require to be burned at this point. Probably 30% of the total gas supplied would be nearer a true estimate, though experiment could be the only reliable guide.

In making these remarks, he did not wish in any way to condemn the tertiary air setting, but only to point out that the advantages of increased throughput must, at least partially, be offset by increased fuel costs, when the problem became an economic one.

A Development of the Recuperator Setting.

Mr. Risby replied by thanking Mr. Branson for his very kind remarks and interesting "lecture." He said he did not pretend to be a first-class physicist and was obliged for the constructive criticism. Their respective figures were in the same direction, although his own figures would appear more favourable to the tertiary air system, which, in the circumstances, might be understood. The tertiary air setting was compared with the generator setting since the tertiary air setting was essentially a development of the recuperator setting and had for its primary object increased carbonizing capacity rather than any conservation of fuel. It had always been the practice, if one wished to increase the throughput, to increase the combustion chamber temperatures. In order to increase the throughput of an ordinary recuperator setting by 40%, it would be necessary to increase the combustion chamber temperatures from 1350° C. to 1500° C. By introducing the tertiary air system the same increased throughput could be effected without increasing the central combustion temperature at all. The mean heating chamber temperature was increased by facilitating combustion on the "wall" sides of the retorts to raise the temperatures at this point to the equivalent of the central combustion chamber temperature, instead of running up the combustion chamber temperature to impossible figures. He thought they would agree that, from a practical point of view, this did not sound too fantastic. He was not discussing the whole question of fuel economics, since that would involve a treatise on the policy of adopting waste-heat boilers—which he had already suggested had been a rather dubious proposition in connection with efficient recuperation. But, obviously, since the introduction of the tertiary air system would amply justify the use of waste-heat boilers in connection with efficient recuperation, then in addition to the possible 40% increase in carbonizing capacity of the plant, the economics of fuel conservation would be justified by the increased overall thermal efficiency of the complete unit. Mr. Risby suggested that Mr. Branson's experience with the tertiary air system had been confined to a setting which had been inefficiently designed and which had recently been reconstructed with improved features. Perhaps it would be more fair to wait until that setting was put to work again, when, despite the fact that even then it would not embody all the features essential for 100% efficiency, it would justify its claims. Possibly Mr. Branson would honour the Association by presenting a paper on "The Practical Application of the Tertiary Air System."

In reply to a member who pointed out that he had given definite statements of fact in his paper, Mr. Risby stated that the figures and facts given were merely those which might reasonably be expected, which statements had been substantiated in practice. He suggested that the results set out of reduced temperature maxima were perfectly practicable by working at reduced temperatures. Those statements were such as might legitimately be expected in a tertiary air setting.

Mr. Percival remarked that if a large coke was required it was necessary to carbonize slowly—and *vice versa*. It was the evolution of gas from the charge which decided the final nature of the coke and rapid penetration of heat resulted in a smaller coke.

Mr. Risby thanked Mr. Percival for confirming his statements to that effect.

Vote of Thanks.

A hearty vote of thanks to Mr. Risby for his paper was carried on the proposition of Mr. J. W. Webber (Croydon), the Junior Vice-President, seconded by Mr. H. W. H. Butterfield (South Suburban), which Mr. Risby briefly acknowledged.

South-Eastern Gas Corporation, Ltd.

First General Meeting Reveals Good Prospects

The First Ordinary General Meeting of the South-Eastern Gas Corporation, Ltd., was held at the Registered Offices, 84, Horseferry Road, S.W. 1, on Wednesday, Dec. 13—Sir David Milne-Watson, LL.D., D.L., the Chairman, presiding.

The Joint Secretary (Mr. G. C. Holliday) read the notice convening the meeting.

THE CHAIRMAN'S ADDRESS.

The Chairman said: This meeting is being held mainly for the purpose of formal compliance with the Companies Act, 1929. With a holding Company such as the South-Eastern Gas Corporation, whose revenue is derived almost entirely from the dividends it receives from its investments, it is not possible to take stock of its position until sufficent time has elapsed to enable the dividends to be received in respect of a full year. In our case this will not be until the first quarter of the new year is over, and therefore we have fixed March 31 as the date for closing our accounts. At any other time prior to that date an incomplete and quite misleading account would have to be submitted, and therefore it is not proposed to attempt it at this juncture.

It is however possible to give you details of the progress made in regard to obtaining control of the group of undertakings situated in the south-eastern portion of the country. The Undertakings in which we have acquired a majority holding are twelve in number and comprise the following:

Broadstairs	Folkestone	Sheppy
Deal	Gravesend	Sittingbourne
Dover	Maidstone	Tunbridge Wells
East Kent	Rochester	Whitstable

In addition to the above we have purchased outright the small Undertaking of Charing, and this, for practical working purposes, has been attached to the Maidstone Undertaking.

The total annual sales of gas for the whole group may be roughly stated as 3500 million c.ft., and, for the purpose of comparison, this quantity is more than the output of a town of the size of Leeds or Edinburgh.

The capital issued by the Corporation to date is £834,817 ordinary shares, £731,111 4½% redeemable preference shares, and £450,000 4% redeemable debenture stock—in all a total of £2,015,928.

At the end of September it was possible to recommend the payment of an interim dividend for the half-year at the rate of 6% per annum on the ordinary shares of the Corporation, and this was accordingly declared and paid.

The Corporation's Policy.

The policy of the Corporation is to assist the various Companies under its control by every means in its power in order to consolidate their position, and for this purpose the services of the Gas Light and Coke Company—the largest Company of its kind in the United Kingdom, if not in the whole world—have been enlisted in an administrative capacity. It is hoped that by so doing the vast resources and experience of that Undertaking may be available in every way for the benefit of our Companies both severally and as a whole. Already it has been possible to organize a system of central buying of stores and raw materials, by means of which prices have been materially reduced, and this, and other advantages we feel sure, will enable the companies in due course to reduce the price of gas so that they may be in a still better position to meet the competition of electricity.

It may be stated that the Corporation has made more rapid progress than was anticipated when it was started less than a year ago. At that time the authorized capital was £1,000,000. It is now, as you are, of course, aware, £2,000,000, and if the debenture capital is brought in, the amount that will eventually be available for capital purposes will be practically £2,500,000. This broadening of the Corporation's interests has meant a great deal of increased activity on the part of the direction and the management, and as the outlook expands still further this activity will be even more pronounced. On the whole I may say we are very satisfied with the progress we have made, and with the present group of substantial Companies the prospects of the Corporation are good.

Re-Elections.

On the proposition of the Chairman, seconded by Mr. Henry Woodall, Major Julian Day and Mr. K. W. Hickman, being the Directors retiring by rotation, were unanimously re-elected.

The Corporation's Auditors, Messrs. Cash, Stone, & Co., were appointed to hold office until the following ordinary general meeting at a remuneration to be fixed by the Board of Directors.

Vote of Thanks.

Mr. T. S. Hambling then moved a hearty vote of thanks to the Chairman and Directors, and thanked Sir David for his most interesting and informative speech.

This was seconded by Mr. L. W. Hall, and carried unanimously, the Chairman briefly acknowledging.

The meeting then terminated.

Dry Purification—Some New Methods for Its Control*

By W. A. Currie, Junr., Technical Assistant, Glasgow Corporation Gas Department.

(*Continued from p. 721.*)

Estimation of Ammonia.

A sample of the gas, about 200 c.c., is taken in a dry gas-sample tube, so that there is no deposition of water. The sample tube is immersed in water in a thermostat at room temperature for five or ten minutes, when the temperature is noted, and the barometer read. These give the gas volume factor. In the case of traces of ammonia, this is an unnecessary refinement.

The ammonia is extracted by blowing quantities of 5 c.c. each of 1% sulphuric acid into the tube through a glass U-tube. These quantities (three being ample) are collected in a nessler tube, and after suitable dilution with ammonia-free water the yellow colour is developed with nessler solution and nesslerized with $\frac{N}{400}$ ammonium chloride in the usual manner.

Calculation may be simplified by using a chart.

The method has given excellent agreement with the acid and alkali titration method, and the nessler reagent has not shown any sign of being affected by the sulphide ions extracted from the gas by the dilute acid.

$$\text{Grains ammonia per 100 c.ft.} = \frac{\text{c.c. } NH_4Cl \times 15{\cdot}43 \times \text{G.V.F.} \times 28{,}317 \times 100}{\text{Capacity of tube in c.c.} \times 400}$$

For convenience in calculation the reciprocal factors published by the Gas Referees have been used.

Estimation of Hydrogen Sulphide.

This estimation is carried out by taking a sample in a gas tube as in the case of the ammonia estimation, with precautions, if required, against formation of water in the connections and tube. The procedure is similar to that employed in the previous estimation. A 2% solution of sodium hydroxide is used for extraction of the hydrogen sulphide, and is used, as before, in three quantities of 5 c.c. each. These are combined in a nessler tube diluted to 50 c.c., and a colour developed with a solution of sodium nitroprusside. The colour is nesslerized with a solution of hydrogen sulphide prepared as follows:

50 grammes of a 2% solution of sodium hydroxide are tared in a conical flask fitted with a cork carrying an inlet and outlet glass tube, the inlet dipping into the solution. Hydrogen sulphide is passed in until the weight increases by 0·2 gramme for each litre of solution to be prepared. This stock solution is then diluted in a prepared bottle of the type used for barium hydrate, titanous chloride, &c., solutions, and covered by a quarter-inch layer of petroleum ether (B.P. 40-60° C. answered well).

This solution is sufficiently stable for use in technological work with occasional standardization. The solution may be standardized by the following method:

100 c.c. is measured into a long-necked flask, and 10 c.c. of 1% sulphuric acid added followed immediatelv by an excess (0·2 gramme) of sodium bicarbonate, then by an excess (20 c.c.) of $\frac{N}{10}$ iodine solution. The excess iodine is titrated by $\frac{N}{10}$ thiosulphate.

$$\text{Gramme } H_2S \text{ per litre} = \frac{\text{c.c iodine} \times 34}{10 \times 254 \times 100}$$

The nesslerization is carried out as quickly as possible to avoid oxidation of the hydrogen sulphide. The colour of the sample is developed by adding the dilute (1% solution) of sodium nitroprusside drop by drop so long as a colour continues to form. An equal quantity is added to the standard, along with 5 c.c. of the 0·2% sodium hydroxide, and hydrogen sulphide solution added till the intensity of the colours is equal. The colour given by the sample has a blue tint which is absent from the standard. A very dilute solution (about 0·5%) of sodium bicarbonate, added drop by drop as required will give the necessary equalization of the colours.

$$\text{Grains } H_2S \text{ per 100 c.ft.} = \frac{\text{c.c. } H_2S \text{ solution} \times \text{G.V.F.} \times \text{conc. of solution}}{\text{Capacity of tube in c.c.}}$$

Having dealt with the analysis and testing of the materials and of the gas to be purified, let us return to the first factor given on the first page of this paper, the design of the boxes. Since the paper is restricted to minor alterations, our attention is chiefly directed to the technical control of the process.

The following factors will be generally accepted as the most important:

(*a*) Moisture content.
(*b*) Porosity and structure.
(*c*) Temperature.

It is now generally agreed that purifying materials work best with a fairly high moisture content, and that optimum purifying capacity and sensitivity is associated with a definite moisture content for each material.

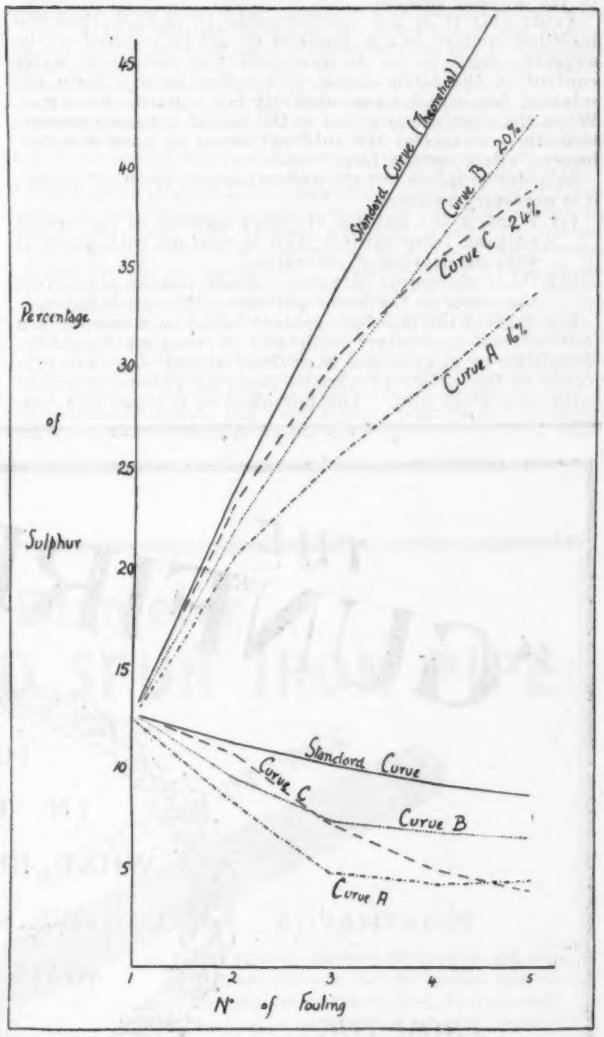


Fig. 1.

In the case of bog ores worth consideration for purifying purposes the optimum water content is in the region of 20-24%. This has been shown by several workers and curves and need not be shown here. Fig. 1 shows the results of fouling a sample of Dutch ore five times under controlled moisture conditions. The upper curves give the percentage sulphur in the samples after each fouling, and a standard line corresponding to an initial sulphur percentage of 12·5 and no loss of purifying capacity. The lower curves show the increments of sulphur at each fouling expressed as percentages of fouled material and a standard line corresponding to the upper standard line.

The lines show clearly the effect of the water. A pre-

* Paper before the Public Works, Roads, and Transport Congress (1933), Nov. 14.

vious set of foulings having shown an optimum water content of 21% samples were prepared containing 16, 20, and 24% water, and fouled in hard glass tubes with hydrogen sulphide. The moisture in the revivified oxide was determined and the percentage water increased to the appropriate figure by adding a calculated weight of water.

It will be seen that curve A (16%) starts off a little behind the others, and rapidly falls away, the increments settling down to about 4·5% at the third fouling.

Curve C (24%), on the other hand, shows the best initial result and holds the lead till the third fouling, where curve B gains a slight lead. Curve C increments show a very rapid drop without any sign of a recovery.

Curve B (20%) shows a regular deviation from the standard, while the increments show the corresponding similarity, and the highest level of the three samples.

It is evident from the curves that, to obtain the best results, this material should have initially a water content of 24%, which should be reduced to 20% at the fourth fouling, and perhaps to 22% at the second. Calculating an initial water content of 24%, and of hydrated ferric oxide 65%, to the fouled material containing 36% sulphur, the proportional moisture content is found to be 16%. The 20% figure would allow some moisture for the saturation of the sulphur present.

From this it is not unreasonable to deduce that the moisture content in the material should be reduced as the sulphur rises so as to maintain the optimum water content in the ferric oxide with sufficient to satisfy the sulphur, &c., which have relatively low capacity for water. When the moisture is added in the initial optimum proportion, the excess (for the sulphur) seems to have a water-logging effect on the ferric oxide.

In order to follow out the deduction as a practical policy, it is necessary to know:

(*a*) What is the natural moisture content of the ore at varying temperatures, and in contact with gases of varying degrees of saturation.

(*b*) What movement of water is likely to take place from the upper to the lower portions of the oxide layer.

Fig. 2 gives the moisture content found in a sample of a German ore in contact with gas of varying humidity. Quantities of 10 grammes each dried at 105° C., were subjected to the action of various gases at various temperatures in a glass tube. The humidity of the gas was controlled by using various glycerine solutions and the dew-point found by the ether evaporation apparatus.

The curves show that the capacity of this oxide increases with the degree of saturation of the gas and with the temperature of the oxide during the absorption. The moisture content required in practice 24 to 15% is not attained at ordinary temperatures so that it is necessary to take precautions to protect the material from loss of water beyond the reduction allowed.

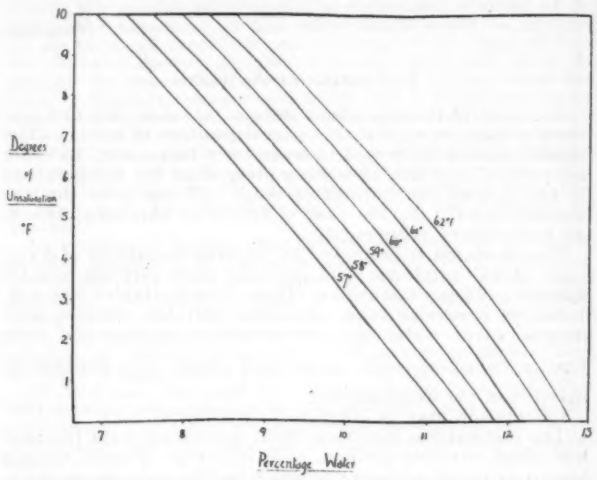


Fig. 2.

It is obvious that the gas should be saturated with steam when it enters each individual box and should not rise above, nor fall appreciably below, its initial temperature while it is in the box.

If this proposition is accepted, it follows:

1. Closed steam heating should be directed to preheating the gas and countering radiation where necessary.

(Apart from their effect on the dew-point of the gas it is well known that closed heaters in the

THE "GUNFIRE"

TO ALL OUR FRIENDS
IN THE GAS INDUSTRY
WHAT BETTER WISH FOR CHRISTMAS
CAN WE SEND YOU THAN TILL IT COMES
AGAIN MAY GOOD HEALTH &
SUCCESS ATTEND YOU

FROM THE DIRECTORS & STAFF OF

— THE BRITISH, FOREIGN, AND COLONIAL —
AUTOMATIC LIGHT CONTROLLING COMPANY, Ltd.
The Pioneers of Automatic Street Lighting
BOURNEMOUTH

boxes lead to short-circuiting due to localized drying of the purifying material).

2. All inlet valves and inter-connections (*i.e.*, centre-valves, &c.) should be lagged to prevent cooling and consequent deposition of water.
3. The four-box system is justified on the ground that the material is revivified in a moist atmosphere and drying of the material is minimized.

The next question which arises is the replacement of water lost in revivification (other losses being prevented). Laboratory tests do not bear out the theory that water added to the top of the layer will find its way to the bottom. A sample of German bog-ore containing 38·5% of water (*i.e.*, nearly twice the requirement) was set to stand in a vertical position in a 1 in. bore tube, 36 in. long, for 10 days. At the end of this time, the oxide was removed in 6-in. sections, representing the zones from the top to the bottom. 20 gramme quantities were dried in petrie dishes at 105° C. for 3 hours. The results varied irregularly between 38·51 and 38·57%, so that there was no migration of water.

Fig. 1 indicates that the moisture content could be raised by raising the temperature of the oxide, and saturating with steam-saturated gas. In the absence of practical work from this point of view, it is unwise to dogmatize, but the best policy would appear to be prevention of loss, by close control of revivification conditions.

The remaining factors referred to—structure, porosity, and temperature—are not readily studied, but the first two appear to be dependent chiefly on the moisture content, with proportion of clay matter and crystalline structure of the ferric oxide grains as constants for each particular sample.

Temperature/capacity curves for bog-ores usually show a very level line with a slightly raised maximum between 65° and 70°, while practical experience goes to show a continuous improvement in results with rise in temperature. It is possible that this is explained by fig. 2, the higher temperatures giving a higher natural moisture content and therefore higher capacity. In addition to this, there is less probability of water-logging (Curve A, fig. 1) when the temperature is high, unless open steam heating is used. Laboratory capacity/temperature curves, being carried out at optimum water content, are not affected by the practical troubles associated with variable water content.

[*Our report of the discussion on Mr. Currie's paper will be published later.*]

Gas Progress in Toronto.

The Eighty-Fifth Annual General Meeting of the Consumers' Gas Company of Toronto was held at the Company's Auditorium, 55, Adelaide Street East, on Nov. 13, 1933. In the absence of the President, Mr. A. W. Austin, the Vice-President, Mr. Arthur Hewitt, was called to the chair.

The Secretary presented the annual report of the Directors and the financial statements and reviewed the items in the income account and balance-sheet, making special reference to the startling increases in the amounts paid for taxes, customs duties, and other items of uncontrollable expense, which had taken place during the three years from 1930 to 1933, the effect of which had been to add to the operating costs for the year just ended, an amount of $370,000,000.

In moving the adoption of the Annual Report of the Directors, the Vice-President, Mr. Arthur Hewitt, said: The Company's revenue from gas sales during the past year, shows a reduction from that of the preceding year. Compared with the year of 1930, the percentage of the reduction in gas sales is 5·43%, while the total sales of manufactured gas to consumers throughout the United States in the same three-year period, from 1930 to 1933, registered a decline of 16·9%.

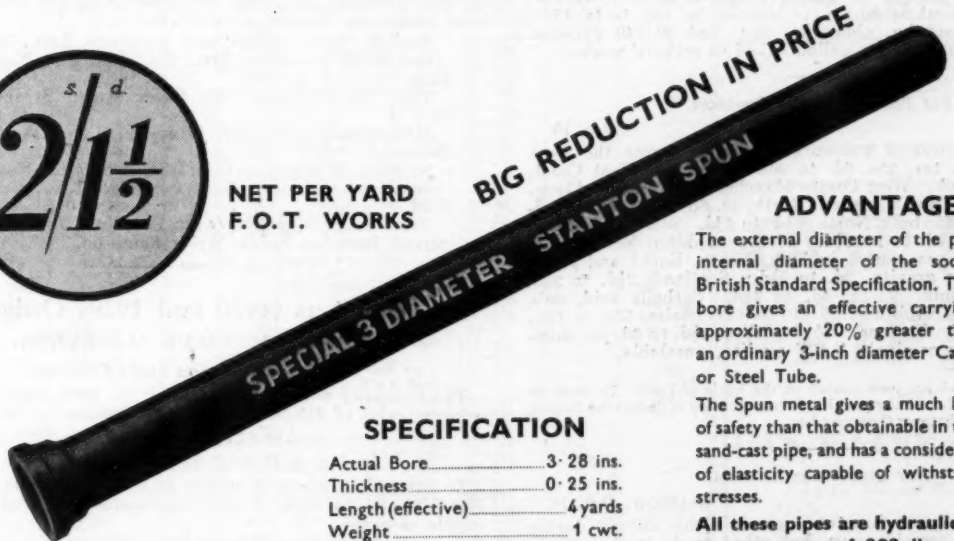
A few years ago, any business statement showing a loss in sales or in revenue would have been regarded as anything but encouraging; but in the light of the history of business of all kinds during the past four years, the report of the year's operations of the Company must be regarded as satisfactory.

One result of economic conditions has been intensified fierceness of competition, and the invasion of the fuel market by those who would seek business anywhere it may be obtained and sometimes almost at any price. In Toronto, our principal competitor for certain classes of business is exempt from the heavy burden of taxation—Dominion, Provincial, and Municipal—which this Company has to carry. In this respect, the competition can hardly be considered as fair. Notwithstanding this handicap, however, I have every confidence that this Company, with its long experience in furnishing the most dependable, most flexible, and, for the most part, the most efficient and economical fuel, will continue to enjoy the major part of the domestic cooking and water-heating business of the citizens of Toronto and the surrounding districts.

Special 3″ Diameter
STANTON-DELAVAUD SPUN IRON PIPE

s. d.
2/1½
NET PER YARD
F.O.T. WORKS

BIG REDUCTION IN PRICE



SPECIFICATION

Actual Bore	3·28 ins.
Thickness	0·25 ins.
Length (effective)	4 yards
Weight	1 cwt.
Coating	Coated both sides, outside only, or uncoated

ADVANTAGES

The external diameter of the pipe and the internal diameter of the socket are to British Standard Specification. The increased bore gives an effective carrying capacity approximately 20% greater than that of an ordinary 3-inch diameter Cast Iron Pipe or Steel Tube.

The Spun metal gives a much larger factor of safety than that obtainable in the ordinary sand-cast pipe, and has a considerable degree of elasticity capable of withstanding high stresses.

All these pipes are hydraulically tested to a pressure of 200 lbs. per sq. in. before despatch.

THE STANTON IRONWORKS COMPANY LIMITED, Near NOTTINGHAM

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Fairly active conditions were reported from several departments of the Stock Exchange last week despite the advent of the Christmas season when business usually tends to diminish. A strong undertone of confidence, however, was discernible in practically all sections, for markets were encouraged by the latest Board of Trade returns, which showed a very satisfactory increase in industrial activity, and also by the favourable outlook regarding the Budgetary position. British Government securities were the chief feature, being in strong demand throughout the week, and prices strengthened. While it is anticipated that business will be somewhat limited during the forthcoming three-week account, the general situation is decidedly optimistic.

An appreciable volume of business was recorded in the Gas Market, and several upward price movements took place. Business in Imperial Continental ordinary was particularly active, and the price rose a further 8 to 213, the yield at this price working out at £5 12s. 8d. p.ct. This yield is based on a dividend of 12%, the rate paid for the first full year on the increased capital, which compares with 10¾ p.ct. for 1931-32, when, it will be remembered, the Association paid an interim dividend of 7½% on a capital of £2,800,000 and a final dividend of 7% on this amount of capital, doubled by the distribution of a capital bonus of 100%. The ordinary stock of the European, another Company operating on the Continent, was also in demand, and here again the price rose 8 to 132½, the yield in this case on a 6 p.ct. (free of tax) dividend being a trifle over 6%. Gas Light units strengthened 3d. to 26s. 6d., business being done ta 26s. 10½d., and Bournemouth sliding-scale moved up 3 to 200. The ordinary stocks of East Surrey, Liverpool (on the local Exchange), Tottenham, and Wandsworth each gained 1 point.

Current Sales of Gas Products.

The London Market for Tar Products.

LONDON, *Dec.* 18.

There are no changes to report in the prices of tar products, which are as follows:

Pitch is about 70s. per ton f.o.b.

Creosote, 3d. to 3¼d. per gallon.

Refined tar, 4d. to 4¼d. per gallon in bulk at makers' works.

Pure toluole, about 3s. 3d.; pure benzole, 1s. 10d. to 1s. 11d.; 95/160 solvent naphtha, about 1s. 9d.; and 90/140 pyridine bases, about 5s. 3d.—all per gallon naked at makers' works.

Tar Products in the Provinces.

Dec. 18.

The average prices of gas-works products during the week were: Gas-works tar, 25s. 6d. to 30s. 6d. Pitch—East Coast, 62s. 6d. to 65s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 62s. 6d. to 65s.* Toluole, naked, North, 2s. 6d. to 2s. 8d. Coal-tar crude naphtha, in bulk, North, 6½d. to 6¾d. Solvent naphtha, naked, North, 1s. 7d. to 1s. 7½d. Heavy naphtha, North, 10½d. to 11d. Creosote, *ex* works, in bulk, North, liquid and salty, 2½d. to 2¾d.; low gravity, 2d. to 2½d.; Scotland, 2¼d. to 2¾d. Heavy oils, in bulk, North, 4d. to 4¼d. Carbolic acid, 60's, 2s. 3d. to 2s. 4d. Naphthalene, £10 to £11. Salts, 55s. to 75s., bags included. Anthracene, "A" quality, 2½d. to 3d. per minimum 40%, purely nominal; "B" quality, unsalable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Dec.* 16.

Practically no change has taken place in this district during the week. Pitch remains easy, but other products are scarce, particularly for prompt.

Crude gas-works tar.—The actual value is 40s. to 42s. per ton *ex* works.

Pitch.—Export price is called 62s. 6d. per ton f.o.b. Glasgow. For home consumption the price is round 62s. 6d. per ton *ex* works in bulk.

Refined tar.—Business is on a small scale at 3¼d. to 3⅜d. per gallon f.o.r. in buyers' packages.

Creosote oil.—Prices continue firm. B.E.S.A. specification is 3¼d. to 3⅜d. per gallon; low gravity, 3⅜d. to 3⅝d. per gallon; and neutral oil, 3⅜d. to 3⅝d. per gallon—all in bulk *ex* works.

Cresylic acid.—Sellers are comfortably placed and buyers are now well covered. Pale, 97/99%, is 1s. to 1s. 1d. per gallon; dark, 97/99%, 10d. to 11d. per gallon; and pale, 99/100%, 1s. 3d. to 1s. 4d. per gallon—all f.o.r. in buyers' packages.

Crude naphtha commands 4½d. to 5d. per gallon *ex* works in bulk, according to quality and quantity.

Solvent naphtha.—90/160 grade commands 1s. 6d. to 1s. 7d. per gallon, while 90/190 quality is quiet at 1s. per gallon.

Motor benzole.—The price is purely nominal at 1s. 7d. per gallon *ex* works.

Pyridines.—A further increase in value has taken place, but supplies are negligible. 90/160 grade is 4s. to 4s. 3d. per gallon, and 90/140 grade is 4s. 6d. to 5s. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s. d.		s. d.	
Crude benzole	0 10	to	0 10¼	per gallon at works
Motor "	1 5	"	1 5½	" " "
Pure "	1 8½	"	1 9	" " "

Contracts Advertised To-Day.

Condenser.

Ramsgate Corporation Gas Committee. [p. 844.]

New Capital Issue.

Harwich Gas and Coke Company.—The tenders for the £20,000 of 4½% permanent debentures, which were received on behalf of the Directors of this Company, were opened on Dec. 12. The tenders ranged from £110 per £100 down to the minimum of par, the average price obtained being £101 7s. 2d.%.

Diaries, Calendars, &c.

Receipt is acknowledged of seasonable gifts in the form of diaries, calendars, &c., from the undermentioned friends, whose good wishes are heartily reciprocated:

BRITISH THOMSON-HOUSTON COMPANY, LTD., Rugby.

GAS METER COMPANY, LTD., 238, Kingsland Road, London, E. 2.

THE "IRONMONGER," 28, Essex Street, Strand, London, W.C. 2.

MOUNTSORREL GRANITE COMPANY, LTD., Welford Place, Leicester.

STANTON IRONWORKS COMPANY, LTD., near Nottingham.

STAVELEY COAL AND IRON COMPANY, LTD., near Chesterfield.

ZINC ALLOY RUST-PROOFING COMPANY, LTD., Shakespeare Street, Horseley Fields, Wolverhampton.

Gas Acts (1920 and 1929) Orders.

CALORIFIC VALUE ALTERATION.

Wells (Somerset) Gas Light Company.

The Company will, as from March 31, 1934, supply gas of a calorific value of 475 B.Th.U., in substitution for 450 B.Th.U.

SPECIAL ORDERS.

Accrington District Gas and Water Board.

To extend the limits of supply so as to include the Parish of Wiswell, and to make further provisions with regard to the supply of gas.

Great Wigston Gas Company.

To extend the limits of supply, to enable the Company to raise additional share capital, &c.

Lea Bridge District Gas Company.

To authorize the Company to use scheduled lands for gas purposes, and to make various financial provisions.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

Issue. £	Share.	When ex-Dividend.	Dividends. Prev. Hf.-Yr. % p.a.	Dividends. Last Hf.-Yr. % p.a.	NAME.	Quotations. Dec. 15. (Provincial Exchanges Dec. 15.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
1,551,868	Stk.	Oct. 9	7	7	Alliance & Dublin Ord. ...	122—123	...	129—130½
374,000	"	July 10	4	4	Do. 4 p.c. Deb. ...	90—100	...	...
557,655	"	Aug. 28	7	7	Barnet Ord. 7 p.c.	167—172	...	171
300,000	1	Oct. 23	1/9½	1/4½	Bombay, Ltd.	26/—28/-	...	27/—27/9
178,380	Stk.	Aug. 14	9½	9½	Bournemouth sliding scale	195—205	+3	202½
550,050	"	"	7	7	Do. 7 p.c. max. ...	163—168	...	164½
489,160	"	"	6	6	Do. 6 p.c. Pref. ...	135—140	...	...
50,000	"	June 26	3	3	Do. 3 p.c. Deb. ...	75—80	...	...
163,025	"	"	4	4	Do. 4 p.c. Deb. ...	102—107	...	...
210,000	"	"	5	5	Do. 5 p.c. Deb. ...	120—125	...	...
357,900	"	Aug. 28	7½	7½	Brighton, &c. 6 p.c. Con. ...	160—170	...	167—167½
540,000	"	"	6½	6½	Do. 5 p.c. Con. ...	147—152	...	150½—151½
195,500	"	"	6	6	Do. 6 p.c. B Pref.	136—141	...	...
1,487,500	"	July 24	5	5	Bristol 5 p.c. max.	113—114*a*	...	...
120,420	"	June 26	4	4	Do. 1st 4 p.c. Deb. ...	99—101*a*	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	99—100*a*	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	121—123*a*	...	...
855,000	"	Sept. 25	8	7	British Ord.	155—160	...	...
100,000	"	June 26	7	7	Do. 7 p.c. Pref.	147—152	...	...
850,000	"	"	5½	5½	Do. 5½ p.c. Pref. ...	108—113	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	94—99	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	108—113	...	...
160,000	"	June 26	5	5	Cambridge 5 p.c. Deb. ...	115—120	...	...
100,000	10	May 29	6	4	Cape Town, Ltd.	6⅞—7⅞	−⅛	...
100,000	10	Nov. 6	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¾	...	7
150,000	Stk.	June 26	4½	4½	Do. 4½ p.c. Deb. ...	95—100	...	...
626,860	"	July 24	6	6	Cardiff Con. Ord.	123—128	...	...
237,860	"	June 26	5	5	Do. 5 p.c. Red. Deb.	108—110	...	...
157,150	"	Aug. 14	6½	5	Chester 5 p.c. Ord.	115—125*b*	...	...
98,986	1	Oct. 9	2/-	2/-	Colombo, Ltd. Ord.... ...	1⅞—1⅞	...	...
24,500	1	"	1/4⅜	1/4⅜	Do. 7 p.c. Pref. ...	19/—21/-	...	...
609,304	1	Oct. 9	/11'48	/11 48	Colonial Gas Assn. Ltd. Ord.	⅛—1⅛	...	20/6
296,053	1	"	1/8'30	1/8 30	Do. 8 p.c. Pref.	23/—25/-	...	24/6
1,796,955	Stk.	July 24	6½	5	Commercial Ord.	122—127	...	124—125
475,000	"	June 12	3	3	Do. 3 p.c. Deb. ...	75—80	...	78
265,272	"	Mar. 6	—	5	Do. 5 p.c. Deb. ...	121—126	...	126
807,560	"	Aug. 14	7	7	Croydon sliding scale	150—155	...	...
469,590	"	"	5	5	Do. max. div.	105—110	...	...
500,000	"	July 10	5	5	Do. 5 p.c. Deb.	120—125	...	...
543,270	"	Mar. 6	7	10	Derby Con.	170—180*c*	...	...
55,000	"	July 10	4	4	Do. 4 p.c. Deb.	98—100*c*	...	...
209,000	"	Aug. 28	5	5	East Hull Ord. 5 p.c. ...	108—113	...	...
179,500	"	Aug. 28	6	6	East Surrey Ord. 5 p.c. ...	128—133	+1	131—133
155,019	"	June 26	5	5	Do. 5 p.c. Deb. ...	117—122	...	119
1,002,180	"	Sept. 25	†7	†5	European, Ltd.	130—135	+8	130—134
19,373,992	"	Aug. 14	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	26/—27/-*f*	+·/3	26/3—26/10½
2,600,000	"	"	3½	3½	Do. 3½ p.c. max.	86—89	...	88½—89
4,477,106	"	"	4	4	Do. 4 p.c. Con. Pref. ...	102—105	...	103½—104
6,102,497	"	June 12	3	3	Do. 3 p.c. Con. Deb. ...	82—85	...	83½—84½
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	115—118	...	118
3,500,000	"	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	112—116	...	114—114½
270,466	"	Aug. 28	6	6	Harrogate New Cons. ...	120—125	...	...
82,500	"	Aug. 28	7	7	Hastings & St. L. 5 p.c. Conv.	149—154	...	...
258,740	"	"	5½	5½	Do. 5½ p.c. Conv.	117—122	...	119
140,000	1	Oct. 9	‡10	1/7½	Hongkong & China, Ltd. ...	29/—32/-	...	30/3
212,200	Stk.	Aug. 14	6	6	Hornsey Con. 5½ p.c. ...	120—125	...	...
5,600,000	"	Nov. 6	14	10	Imperial Continental Cap.	208—218	+8	207—214½
223,180	"	Aug. 14	3½	3½	Do. 3½ p.c. Red. Deb.	90—95	...	92½
285,242	"	Aug. 14	8½	8½	Lea Bridge 5 p.c. Ord. ...	170—175	...	...
2,145,907	"	Aug. 14	6	6	Liverpool 5 p.c. Ord. ...	131—133*b*	+1	...
245,500	"	June 26	5	5	Do. 5 p.c. Red. Pref. ...	103—113*b*	...	...
806,088	"	July 17	4	4	Do. 4 p.c. Deb. ...	99½—101½*b*	...	...
165,736	"	Aug. 28	10	8	Maidstone 5 p.c. Cap. ...	180—190	...	...
56,176	"	July 10	3	3	Do. 3 p.c. Deb. ...	69—74	...	...
75,000	5	Dec. 4	†10	†10	Malta & Mediterranean ...	9—11*	...	...
393,000	—	Oct. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	98—103	...	...
231,278	Stk.	Aug. 28	5	5	M. S. Utility "C." Cons. ...	111—116	...	...
818,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	92—97	...	97
112,126	"	June 26	4	4	Do. 4 p.c. Deb. ...	100—105	...	...
148,955	"	"	5	5	Do. 5 p.c. Deb. ...	118—123	...	...
675,000	"	21 May '31	1§	1§	Montevideo, Ltd.	55—65	...	...
2,061,315	"	Aug. 14	5½	5	Newcastle & Gateshead Con.	25/9—26/9*d*	...	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	101—103*d*	...	...
776,706	"	July 10	3½	3½	Do. 3½ p.c. Deb. ...	92—94*d*	...	...
277,285	"	May 8	5	5	Do. 5 p.c. Deb. '48...	107—109*d*	...	...
274,000	"	Aug. 14	5	5	Newport (Mon.) 5 p.c. max.	101—104*a*	...	...
204,940	"	Aug. 28	7½	7½	North Middlesex 5 p.c. Con.	153—158	...	...
396,160	"	Aug. 14	5	5	Northampton 5 p.c. max. ...	101—106	...	...
800,000	"	Dec. 4	7	†3	Oriental, Ltd.	132—137*	...	...
316,617	"	June 26	8	8	Plym'th & Stonehouse 5 p.c.	167—172	...	...
504,416	"	Aug. 28	8	8	Portsm'th Con.Stk. 4 p.c.Std.	162—167	...	...
241,446	"	"	5	5	Do. 5 p.c. max. ...	102—107	...	...
114,000	"	Aug. 14	5	5	Preston 5 p.c. Pref.	105—110	...	...
686,312	"	July 24	4	4	Primitiva 4 p.c. Rd. Db. 1911	84—93	...	...
389,813	"	June 26	4	4	Do. 4 p.c. Cons. Deb.	88—93	...	90
150,000	10	Sept. 25	6	6	San Paulo 6 p.c. Pref. ...	6½—7½	...	...
1,736,968	Stk.	Sept. 11	6	6	Sheffield Cons.	131—136*e*	...	...
95,000	"	July 10	4	4	Do. 4 p.c. Deb.	90—94*e*	...	...
133,201	"	Sept. 11	5	8½	Shrewsbury 5 p.c. Ord ...	137—142	...	...
90,000	10	June 12	12	14	South African	8—8	...	...
6,709,895	Stk.	Aug. 14	7	5	South Met. Ord.	134—137	...	134½—136½
1,185,812	"	"	6	6	Do. 6 p.c. Irred. Pf.	137—142	...	140½—144½
850,000	"	"	20/-*g*	4	Do. 4 p.c. Irred. Pf.	102—105	...	103—104½
1,895,445	"	July 10	3	3	Do. 3 p.c. Deb. ...	80—83	...	81—81½
1 000,000	"	July 24	5	5	Do. 5 p.c. Red. Deb	112—116	...	116
209,820	"	Aug. 14	8½	8½	South Shields Con.	170—171*d*	...	...
1,543,795	"	Aug. 14	6	6	South Suburban Ord. 5 p.c.	131—136	...	133½
300,000	"	"	5	5	Do. 5 p.c. Pref.	113—118	...	116½—118
300,000	"	"	—	4	Do. 4 p.c. Pref.	100—103	...	103
868,837	"	June 26	5	5	Do. 5 p.c. Deb.	119—124	...	122
100,000	"	"	—	—	Do. 4 p.c. Deb.	102—105	...	...
647,740	"	Aug. 28	5	5	Southampt'n Ord. 5 p.c. max.	108—113	...	...
121,275	"	June 26	4	4	Do. 4 p.c. Deb.	99—104	...	...
350,000	"	Aug. 28	5½	5½	Swansea 5½ p.c. Red. Pref.	107—111	...	...
200,000	"	June 26	6½	6½	Do. 6½ p.c. Red. Deb.	103—108	...	...
1,076,490	"	Aug. 14	6½	6½	Tottenham and District Ord.	149—154	+1	...
300,000	"	"	5½	5½	Do. 5½ p.c. Pref. ...	125—130	+1	126—127
62,235	"	"	5	5	Do. 5 p.c. Pref. ...	113—117	...	...
199,005	"	June 12	4	4	Do. 4 p.c. Deb. ...	98—103	...	...
85,701	"	Oct. 9	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	90—100	...	...
347,769	"	Aug. 28	7	7	Uxbridge, &c., 5 p.ct. ...	144—149	...	...
88,330	"	"	5	5	Do. 5 p.c. Pref. ...	113—117	...	...
1,322,220	"	July 10	7	7	Wandsworth Consolidated	154—159	+1	157½—159
1,096,373	"	"	5	5	Do. 5 p.c. Pref.	118—123	...	120½—122½
1,317,964	"	June 26	5	5	Do. 5 p.c. Deb.	120—125	...	123—124§
158,400	"	Aug. 28	6A	5	Winchester W.&G.5p.c.Con.	115—120	...	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock *g.*—For quarter. *h.*—Paid £3, including 16s. on account of back dividends. §.—The interest due 1/7/33 was paid on that date. * Ex. div. † Paid free of income-tax. ‡ For year. Hongkong & China, Ltd.—paid on £10 shares.

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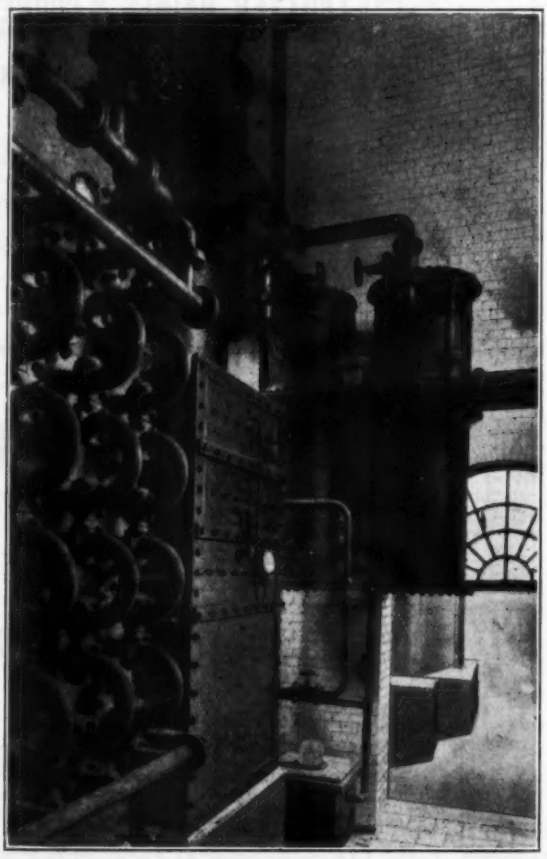

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(*See also p. 443 (Nov. 15) and the "Gas Salesman."*)

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(*See advertisement Nov. 15, p. 462.*)

APPOINTMENTS, &c., VACANT.

PADIHAM URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE above Council invite Applications for the Position of ENGINEER and MANAGER of their Gas Undertaking at a Salary of £400 per Annum, increasing, subject to satisfactory service, by annual increments of £25 to a maximum of £450 per Annum.

Applicants must have had a good Technical Training and Practical Experience in Modern Methods of Gas-Works Construction and Gas Manufacture.

The appointment will be subject to three months' notice on either side, and the person appointed will be required to reside within the Urban District.

Applications, stating Age and giving full particulars of Training and Experience, accompanied by *copies* of Three recent Testimonials, to be delivered to the undersigned in sealed envelope, endorsed "Gas Engineer," not later than 30th December, 1933.

P. WILLIAMS,
Clerk to the Council.

Council Offices,
Padiham,
Dec. 13, 1933.

ABERTILLERY URBAN DISTRICT COUNCIL.

APPOINTMENT OF GAS ENGINEER AND MANAGER.

THE Council invite Applications for the Position of ENGINEER and MANAGER of their Gas Undertaking at a Salary at the rate of £400 per Annum, *plus* £15 per Annum in lieu of gas and coal.

Applicants, who are to be Members or Associate Members of the Institution of Gas Engineers, must possess a good knowledge of, and experience in, Modern Gas Manufacture and Supply, and be capable of undertaking all classes of constructional work connected with a gas undertaking. Sound commercial experience, including Salesmanship, is essential, and it will be an advantage that applicants should have had experience in an Area where gas and electricity are supplied.

Applications, stating Age, Qualifications, Experience, present and previous Appointments, accompanied by *copies* of Three Testimonials of recent date, are to be delivered to the undersigned not later than noon of Monday, the 1st of January next. Envelopes are to be endorsed "Engineer and Manager."

Applicants may supply the undersigned with 20 copies of their applications for distribution amongst the Members of the Council.

D. R. DAVIES,
Clerk to the Council.

Council Offices,
Abertillery, Mon.,
Dec. 18, 1933.

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General Manager, Engineer, and Secretary.
Gas Offices,
Matlock,
Dec. 16, 1933.

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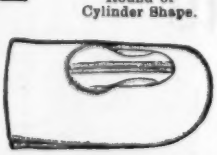
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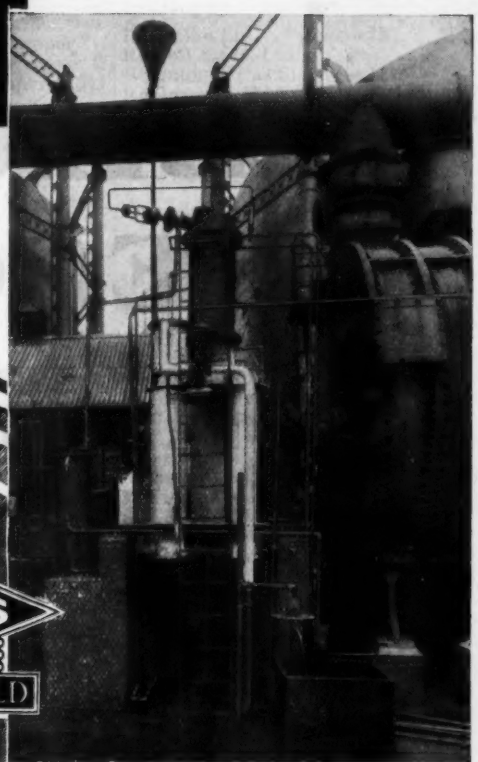

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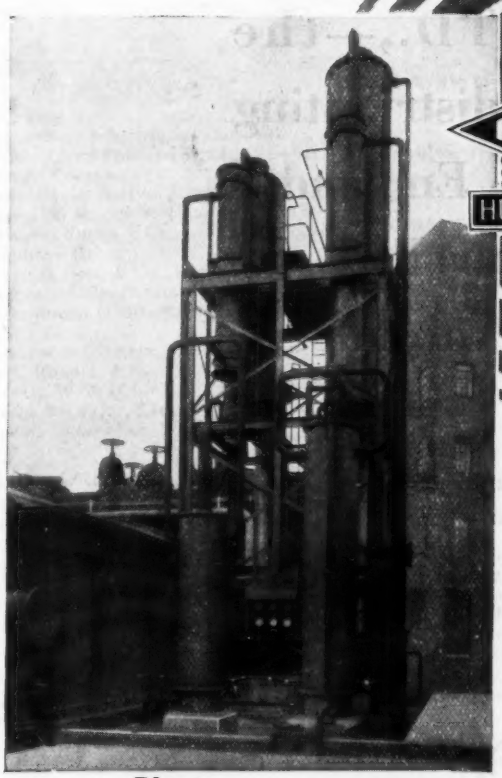

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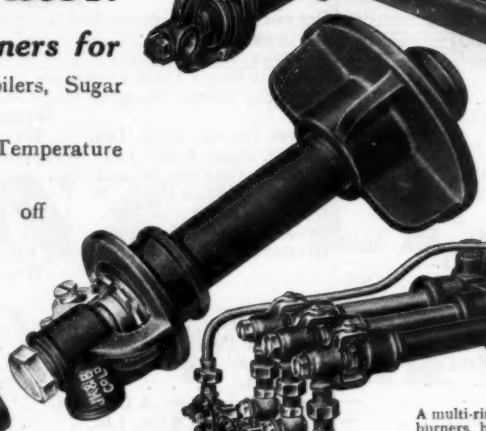

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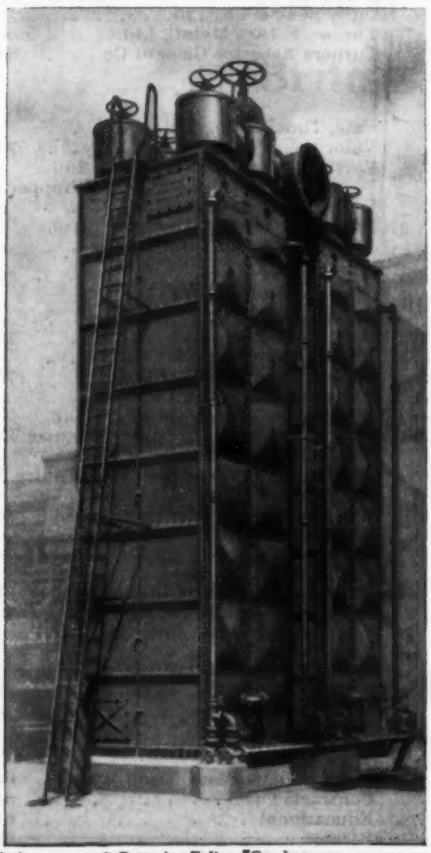

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